ILLUMINATING ENGINEER

XXV | April, 1932 | Price 9d.

INDEX

THE ILLUMINATING ENGINEER

LIGHT
LAMPS
FITTINGS
AND
ILLUMINATION

THE JOURNAL OF
GOOD LIGHTING

OIL
GAS
ELECTRICITY
ACETYLENE
PETROL-AIR
GAS
ETC.

OFFICIAL JOURNAL of
The Illuminating Engineering Society
(Founded in London, 1909, Incorporated 1930)
and of
THE ASSOCIATION OF PUBLIC LIGHTING ENGINEERS
(Founded 1923; Incorporated 1928)

Vol. XXV April, 1932

Price NINEPENCE
Subscription 10/6 per annum, post free.
For Foreign Countries, 15/- per annum.

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J. STEWART DOW

EDITORIAL AND PUBLISHING OFFICES:
32 VICTORIA STREET, LONDON, S.W.1.
Tel. No.: Victoria 5215

The Illuminating Engineering Society

PROPOSED FORMATION OF LOCAL CENTRES IN THE MIDLAND AND NORTH-WESTERN AREAS.

READERS will find in this issue some reference to the special meetings recently arranged in Manchester and Birmingham. (See pp. 92-95.) At the former meeting Mr. C. C. Paterson presented a skilfully prepared survey of the International Illumination Congress. At Birmingham informative papers were read by Mr. D. Spencer-Johns and Mr. P. E. Shopland. In both cases there was a good attendance, and the addresses were closely followed. Keen interest was also shown in the discussion on the formation of local centres.

At occasional meetings held in Manchester and Birmingham in the past expression has been given to the desire to form a local centre. In Manchester, at a meeting held in 1930, a resolution was passed approving this step, and there has since been a steady growth in the local membership, which now approaches 30. There has also been in existence for some time an informal committee of local members, in which Mr. A. E. Jepson, Mr. R. C. Hawkins and others have taken an active part, and which is now receiving the aid of Mr. James Sellars, Public Lighting Engineer to the City of Manchester, as Secretary. This committee was appointed (with power to co-opt others) at the recent meeting in Manchester. It will quietly prepare the way for the formal establishment of a local centre, and in the meantime will arrange for informal meetings, visits, etc.

In the Midland area matters are not quite so far advanced, but in Birmingham, too, a provisional local committee has now been formed. Efforts will be concentrated on inducing others to join and forming a nucleus of members of the Society.

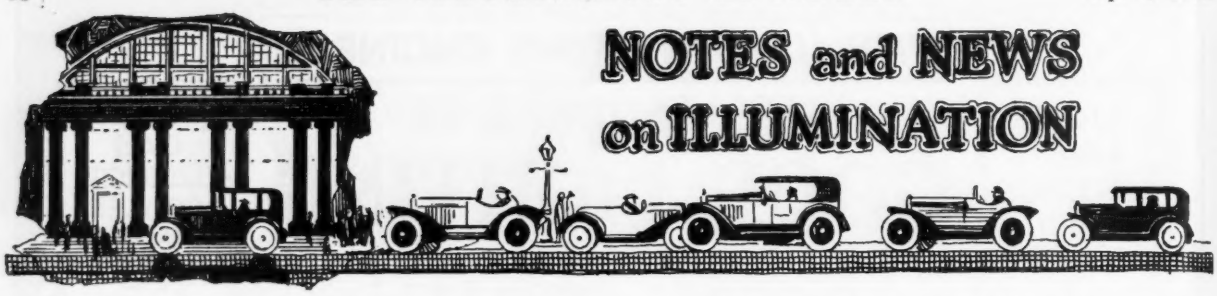
It seems evident that the Illuminating Engineering Society cannot fully develop until the needs of other centres besides London are satisfied, and that membership in such areas cannot grow until at least a prospect of a local centre can be held out. The view has been expressed that at least 50 to 60 local members should be available before a local section could be established, and a permanent basis of working devised. The Midland and North-Western Areas are wisely deferring this step until matters are further advanced. We hope it will not be very long before their efforts are crowned with success and before their example is followed in other parts of the British Isles.

The Floodlighting of London

THE floodlighting of London during the I.I.C. Congress, discussed briefly in Mr. C. C. Paterson's address in Manchester, was a courageous and, in a sense, symbolic action—coming as it did at a moment when the financial crisis had just swept down upon us and the future of this country appeared to be a troubled one. We firmly believe that this display had a psychological influence of considerable value, diverting the national mind and enabling it to take a judicious and dispassionate view of its difficulties. British people are accused of depreciating themselves. Let us for once take comfort in the thought that in the moment of crisis the nation behaved with calmness and courage, and that its subsequent course of action has won world-wide respect.

From this standpoint alone the country has some reason to regard, if not with indulgence at least with tolerance, Mr. Good's plea that floodlighting in London should be put on a permanent basis. The course of the lecture given by him, in association with Mr. J. E. Ames, before the London Society on March 18th, naturally resembled that followed in his paper before the Illuminating Engineering Society in October last. He dealt, however, in greater detail with the objection raised by architects that the shadows cast by artificial floodlighting are different from those characteristic of daylight (" characteristic " is really an inappropriate term, for natural light varies in direction, intensity and diffusion to an extraordinary degree). He also reminded his hearers of a fact too frequently overlooked—e.g., by those who have compared our effects unfavourably with those prepared in Paris—that the installations in London were essentially temporary and hastily prepared displays.

Given adequate time for preparation, sympathetic support from the authorities, and understanding help from the architects, London could be floodlighted in such a way as to become the wonder of the world. During the present period of enforced economy the cost may present difficulties; but even regarded from this standpoint there are advantages to be conferred by floodlighting such as no business man can afford to despise. We suggest, indeed, that to enlightened business men the raising of a fund to be applied for the permanent floodlighting of London would be a project well worth examination, which would prove of permanent benefit to its people, and should rank as an example of the kind of " courageous expenditure " which the Prime Minister has approved.



The Illuminating Engineering Society

FORTHCOMING MEETINGS.

At the next meeting of the Illuminating Engineering Society, to be held in the House of the Royal Society of Arts, on April 26th, a paper on "Progress in Decorative Lighting" will be read by Mr. E. H. Penwarden. It is now quite a number of years since the Society had a paper on fittings design—we believe the contribution by Mr. F. W. Thorpe in 1915 was the last, and Mr. Penwarden's paper may be regarded as carrying on the story from that year.

The subsequent event, on May 24th, will be a joint meeting with the Association of Public Lighting Engineers, at which Mr. E. Marison will read a paper on "The Work of a Public Lighting Department." This meeting has been provisionally arranged to take place at the E.L.M.A. Lighting Service Bureau (15, Savoy Street, London, W.C.), at 6-30 p.m.

Lipton's First Shop

We are indebted to Mr. J. F. Colquhoun for a cutting from the *Glasgow Herald* relating to the little shop in Stobcross Street, Glasgow, which was the foundation of the great business enterprise of the late Sir Thomas Lipton. This shop, which is now passing into other hands, was apparently the very first in which Sir Thomas set up business, and was opened in 1872. In the course of some recent correspondence on the subject reference was made to the enterprise shown by him in lighting and advertising at this early date. It is stated that the shop was always brightly illuminated until closing time, which was 9 or 10 p.m. on week-days and 12 p.m. on Saturdays, and bright lighting was deliberately adopted by Sir Thomas in order to attract the attention of the public. By such means are big businesses built!

The Success of Luminous Traffic Signals in Oxford Street

The progressively increasing and successful use of luminous traffic-control signals in London has shown the incorrectness of the rather parochial view that such methods, however valuable elsewhere, are unsuitable for the Metropolis. Naturally, they cannot be applied indiscriminately, but there are many crossings and continuous streets in London which offer ideal opportunities for luminous-signal control. Oxford Street, where the system is exceptionally complete, has been a particularly successful installation. We are told that the record of accidents shows distinct improvement, and anyone who recalls the chaotic traffic conditions before the change will agree as to the greater ease with which vehicles now make their way. In this case, moreover, the system has made things distinctly easier for the pedestrian—a result that has not attended all the changes introduced in the interests of speedier motor traffic.

Public Lighting in Nottingham

It may be recalled that in December last we published a notice inviting applications for the post of Lighting Superintendent to control the public lighting of the City of Nottingham. This announcement was received with general satisfaction, as an instance of the progressive policy of acquiring the services of an independent and fully qualified expert and placing him in control. It is, therefore, with some dismay that one observes, in subsequent advertisements, that the public lighting assistant is now invited to take charge of the lighting department (apparently at a lower salary) "under the direction of the City Gas Engineer." This change is presumably to be interpreted as an expression of the general desire for economy in the present difficult times. We confess that to us the policy of making the Public Lighting Superintendent of such a city as Nottingham a subordinate position seems to us a mistaken one, and unlikely to prove economical in the long run. Moreover, we have always considered it anomalous that such a position should be held under either the electricity or the gas department—seeing that circumstances demanding an independent choice of one or the other illuminant for street lighting are almost certain to arise.

Mr. D. R. Wilson

APPOINTMENT AS H.M. CHIEF INSPECTOR OF FACTORIES.

Members of the Illuminating Engineering Society will learn with pleasure that one of their Past Presidents, Mr. D. R. Wilson, has been appointed Chief Inspector of Factories in succession to Sir Gerald Belhouse (who will retire on April 13th on attaining the age of 65). Mr. Wilson has been associated with the Factory Department of the Home Office for many years, during which time he has taken a keen interest in illumination, and has served on numerous committees concerned with lighting problems. He was a member of the Departmental (Home Office) Committee on Lighting in Factories and Workshops that issued its first report in 1915, and he took a leading part in the formation of the Illumination Research Committee under the Department of Scientific and Industrial Research. The improvement that has taken place in factory lighting during the past decade is in no small measure due to his influence and that of his Department.

Mr. R. J. Rogers

NEW POSITION.

We learn that Mr. R. J. Rogers, a member of the Illuminating Engineering Society whose name is very familiar to members of the gas industry, will shortly relinquish his position with the City of Birmingham Gas Department, in order to join the Board of the Parkinson Stove Co. Ltd. as managing director. Mr. Rogers has had a life-long connection with the gas industry. We are informed that at one time he filled the position of Public Lighting Superintendent in Birmingham. For several years past he has acted as hon. secretary of the Gas Industries Section of the British Industries Fair at Castle Bromwich, where he was a familiar figure.

TECHNICAL SECTION

COMPRISING

Transactions of The Illuminating Engineering Society and Special Articles

The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.

Some Thoughts on the International Illumination Congress

Proceedings at the Special Meeting of the Illuminating Engineering Society, held in Manchester on March 10th, 1932.

A SPECIAL meeting of the Society was held in the Reynolds Room of the Manchester School of Technology, on Thursday, March 10th.

At the commencement of the meeting brief introductory addresses were delivered by Mr. A. E. JEPSON and by Mr. R. C. HAWKINS, who had taken a leading part in the movement to establish a local centre in the North-West Area, and had been acting on the committee formed to consider the matter. Mr. Hawkins reminded those present that at a meeting held in the city on October 22nd, 1930, a resolution was passed to the effect "That steps should be taken towards the formation of a branch of the Illuminating Engineering Society in the North-Western Area, and that this meeting pledges its support to that end." It was made quite plain at that meeting, he said, that a section could not be formally created until there was a membership of something in the neighbourhood of 50 to 60. At that time the membership was round about a dozen, but it was soon increased to 20, and was now 27. Those interested in the movement thought that the best means of bringing nearer the formation of a branch was to organize another meeting, and it was being held that evening. It seemed preferable that the chairman of such a gathering should be one who was not associated with the commercial side of the lighting industry, and it had been suggested that Mr. Julius Frith, who had nevertheless carried out many excellent lighting schemes, and who was well known to those present, should be asked to preside. (Hear, hear.)

Mr. JULIUS FRITH, on taking the chair, observed that it did not take a very long acquaintance with Manchester to impress one with the fact that the formation of a local centre of the Illuminating Engineering Society was very greatly needed. Although there had been progress, there were still too many examples of how light should *not* be applied. A good augury for the success of the movement to form a centre was that Mr. Paterson had been induced to attend that meeting and give an address. (Applause.)

"SOME THOUGHTS ON THE INTERNATIONAL ILLUMINATION CONGRESS."

Mr. C. C. PATERSON then delivered his address, entitled "Some Thoughts on the International Illumination Congress." (See pp. 92-95.)

The discussion was opened by Dr. J. W. T. WALSH, who said he felt sure he was voicing the opinion of all present when he observed that they had listened with the very greatest interest and pleasure to the address. It had been his good fortune to attend the meetings of the Commission since 1921, and he had been struck by one outstanding feature. In that year the representatives all met round the same table. There were thirty of them, and they all knew something about every one of the subjects that were being discussed. In 1924 they were divided a little, but most of them pretended to know something about the subjects that were being discussed. (Laughter.) In 1928 the gathering was divided into a number of smaller meetings, because it was frankly recognized that it was impossible for every delegate even to pretend to be an expert in the multifarious subjects down for discussion! In 1931 the difficulty became even more noticeable. In this age of specialization one could not become a specialist in the art of illumination generally; a man had to be content to become a specialist in some separate branch of illuminating engineering.

It was interesting to note the manner in which Mr. Paterson had surveyed the different fields in which the Commission had made the greatest progress. He (Dr. Walsh) was pleased to hear Mr. Paterson's comments on the photometer, but he had been too modest to mention that the electric photometer which would very shortly be seen in the streets was largely, if not entirely, the product of the organization over which Mr. Paterson presided.

Aviation lighting was a subject in connection with which the Commission was performing a valuable function. Personally he did not know the first thing about aviation lighting, but he could say that even those who knew nothing about it came away from the Cambridge gathering enthusiastic at the work done by the Commission.

The same might be said in regard to opal glass. There were experts who could speak about it in a most highly technical manner, and they were convinced that very material progress had been made.

There was no doubt that colorimetry was in its infancy so far as the practical application was concerned. There were a few experts in this country, and in the United States, and one or two others in other parts of the world, but there was a distinct cleavage of opinion between them which it had been impossible to bridge by correspondence. When they got together at Cambridge, however, after a good deal of hard work they came to an agreement. In doing so one of their first tasks had been to define an eye with particular characteristics representing the average human eye.

Mr. A. HOLTON said he attended the meetings of the International Illumination Congress at Edinburgh and Buxton, and was certainly impressed by the number of branches into which illumination was now divided. The Illuminating Engineering Society had certainly done a great deal to help in one important respect, i.e., in improving accuracy of measurement. In the very early days of photometry people were apt to go to third places of decimals, which was reducing the thing to an absurdity. Nowadays they were adopting the "yard-stick," by which they could make consistent measurements which could be understood and relied upon.

Mr. J. SELLARS remarked that it was appropriate that in that great building (the School of Technology) mention should be made of the subject of education. They were all interested in the further education of illuminating engineers. One paper read before one of the sections at the Conference contained a most admirable report of the secretariat in charge of that question. He had had the pleasure of submitting that report to the University Court at Nottingham, and the entire syllabus had been taken up. As soon as sufficient students could be obtained they had suitable premises ready, and a professor, with sufficient funds to cover the cost. He put it to the meeting that an effort should be made through the agency of the Illuminating Engineering Society to arrange for something on similar lines in Manchester for the benefit of the younger members. There were great educational facilities in the city, and he was sure if the matter was put before the authorities it would be sympathetically received. A fact of interest to all those present was that in one of the corridors near to the room in which they were assembled there were a number of blue prints; they were the work of an investigator who was engaged on the standardization of lamps, and that worker was the author of the address just delivered.

Mr. WOOD said his firm, who were manufacturers of glass, would be glad to give their wholehearted support to the formation of a Branch of the Society in the North-Western Area. They were constantly getting inquiries about the properties of different kinds of glass manufactured by them, including every description of window glass. People wanted to know exactly what amount of radiation a glass would let through, how much ultra-violet rays came through, and the percentage of transmissions of different wavelengths of light. He felt it would be a great assistance to everyone concerned with building materials, dealing with them in a wide sense but with glass in particular, if a centre could be established at which subjects of that kind could be discussed. At any rate, he and his firm would be only too glad to join in such a movement.

Mr. C. C. PATERSON thanked his audience for the kind way in which they had received his address, remarking that he would be amply rewarded for his trouble if he had helped in the establishment of a really scientific, practical and hard-working centre of the Illuminating Engineering Society.

On the motion of Mr. SELLARS, a hearty vote of thanks was accorded Mr. Paterson for his address.

Mr. J. S. DOW was then invited to address the meeting on the proposed local centre.

PROPOSED LOCAL CENTRE OF THE ILLUMINATING ENGINEERING SOCIETY.

Mr. J. S. DOW, before taking up this subject, said that he would like to endorse what others had said regarding Mr. Paterson's admirable address. He recalled an apt phrase in a previous address of Mr. Paterson's, in which he had alluded to the need of "insight" and "vision" on the part of those who dealt with illumination. He felt sure that they would all agree that Mr. Paterson, in his description of the Congress, had shown considerable insight. In addition, he and the others who were responsible for the organization of the Conference had certainly showed both courage and vision in deciding to carry on with the Congress during a year of unprecedented industrial depression. To those who took part in the opening proceedings in London and witnessed the display of floodlighting which took place it had been an unforgettable experience.

With regard to the suggested formation of a local centre, it would be recalled that this was the third meeting in connection with the movement held in Manchester. Since the question was first mooted steady progress had been made. There were now 27 local members on the list. The Council of the Society were most anxious that everything possible should be done to aid the formation of local centres. It was recognized that only the fringe of the subject was touched if activities were confined to London, and if such large industrial areas as Lancashire were left undeveloped. The creation of local centres was a new departure, and it was necessary to feel one's way. When the matter was discussed by the Council it was thought that there should be at least fifty members before a branch or local centre was formally recognized. This, he thought, was based on the experience of other institutions. It seemed to be a prudent stipulation from the financial standpoint, and was framed with a view to ensuring that a branch, once started, would be maintained. They were well on the way to acquiring that number, and he sympathized with the view Mr. Hawkins and others had expressed, namely, that while it was true that a branch could not be formed until there were members, it was also true that members could not be obtained until there was a branch—or at least some organization prepared to arrange local items of interest.

He thought, however, that an intermediate course was possible. There was already in existence in the North-West Area a group of members, not formally established as a branch, but constituting a local circle, well able to add to their numbers if they carried on by arranging occasional meetings and visits. He suggested that they should carry on informally on this basis, in the expectation that the full quota of members would be reached before long—perhaps by the autumn of the present year—when they could approach the Council in London with the request that a local centre should be formally established. When that stage was reached the Council of the Society would have to make practical arrangements for carrying on the branch. It would be necessary to allocate a certain sum (possibly forming an agreed proportion of the subscriptions of local members) to cover the expense of carrying on the branch. But in the meantime the informal committee already in action could continue their good work, and occasional meetings could be arranged. He felt sure that Dr. Walsh and Mr. Paterson would bear him out when he said that he believed the Council would willingly support such efforts if they were satisfied that a branch was likely to eventuate. There was, however, just one point he should make clear. When the branch was inaugurated the "country members," who at the present time paid a guinea, would automatically become full members and would pay a subscription of two guineas. That applied to men who were vocationally interested in lighting and to others who chose to become corporate members. Those who were *not* vocationally interested in the lighting industry had the option of joining as Associates.

There was also a third form of membership which the Council wished to encourage, and that was the class of "sustaining members." Local firms and

undertakings interested in lighting could become affiliated by appointing a representative who became a corporate member, but a little more than the ordinary subscription was paid (five guineas or more).

The position he had outlined could be fitly expressed in the form of a resolution which he had been asked to propose. The resolution was as follows: "That this meeting recognizes that a local circle of the Illuminating Engineering Society is in existence in the North-Western Area, and looks forward to its formal consummation as a branch of the Society in the autumn of the present year."

Mr. J. D. NETTLETON seconded. The resolution, on being put to the meeting by the CHAIRMAN, was declared carried unanimously.

PROVISIONAL COMMITTEE OF MANAGEMENT.

Mr. J. S. Dow then suggested that perhaps those who had formed the Provisional Committee might now be formally appointed, with additions if necessary, and asked to proceed with the work of preparing for the inauguration of the branch.

Mr. HAWKINS explained that the existing committee was composed of Mr. A. E. Jepson, Mr. J. Sellars (who, it was hoped, would take on the duties of Honorary Secretary), Mr. L. Lacey, Mr. H. J. Robinson, Mr. John Swarbrick, Mr. T. G. Hunter, Mr. F. J. Palin and himself. The committee was already a fairly representative one.

Mr. Dow suggested that some gentleman connected with the Gas Department should be asked to serve on the committee.

The CHAIRMAN remarked that if the present committee was reappointed with power to add to their numbers that difficulty could be overcome. The committee, of course, would be left to appoint its own officials.

Mr. C. C. PATERSON said that the formation of the Provisional Committee was a good idea so long as it was understood that when the branch was formed a new election would take place by ballot. It was essential that the first committee of the North-Western Centre should be appointed on a democratic basis. He hoped the committee would be representative of all phases of activity in the illumination industry, and they should not forget that research organizations could provide real strength on the scientific side.

Mr. R. C. HAWKINS remarked that when the matter was formally discussed in January it was suggested that the area of the branch should include certain parts of Yorkshire. The members of the Provisional Committee thought it desirable that some lead should be given by that meeting as to how far that was practicable and advisable. Leeds, Bradford, Huddersfield, Halifax, and other industrial centres in the Yorkshire area were not very much further away in mileage than Liverpool, and certainly not as far away as some parts of the North-Western Area, and if members could be recruited from those districts it would make a much bigger and more active branch than could otherwise be the case.

Mr. A. E. JEPSON said he had resided in Sheffield, and he knew there was a great interest taken in illumination. Sheffield had the only Illumination Society in existence outside London. It was naturally a modest affair, due to the great enthusiasm of Mr. Colquhoun, but quite an active body. There were many people interested in illumination in the North who could not support the movement in London by their active co-operation, but if a Northern Centre was established to include the towns he had named a strong organization would result. It was encouraging to find such a good attendance that evening, and if the enthusiasm displayed at the meeting was put into a practical form by applications for membership of the branch success would be assured. One had only to look at the lighting efforts in Manchester, Salford, and the neighbouring towns and boroughs to realize that a tremendous push was needed to attain an adequate standard of illumination, not only in the matter of public lighting, but shop and home lighting. There were many present who owed their livelihood, so to speak, to the progress the art of illumination had made, and they ought therefore to render whatever assistance they could.

It was agreed that the names read out by Mr. Hawkins should be elected as a preliminary committee, with power to add to their number, and that they should appoint their own officers.

The proceedings were brought to a close by the passing of votes of thanks to Mr. Frith for his services in the chair, and to the College authorities for the use of the room.

Special Meeting in Birmingham

The special meeting in Manchester, reported above, was followed by a similar gathering in Birmingham, on March 14th, when Mr. S. T. ALLEN (Manager of the Central England Area of the Central Electricity Board) presided.

Two excellent papers by Mr. D. Spencer-Johns on "The Importance of Good Lighting in Commerce and Industry" and by Mr. P. E. Shopland (H.M. Inspector of Factories) on "Some Observations on Lighting in Factories" were presented. The former reviewed the advantages of good illumination and discussed various fundamental points, such as the order of illumination needed and the effects of glare. The latter gave an instructive summary of personal experiences in factories, mentioning the most frequent defects in lighting encountered, and concluding with a tabular record showing how far values of illumination fell below the desirable level.

The discussion was opened by Dr. J. W. T. WALSH, who recalled his own experiences when making measurements in factories in connection with the researches of the Departmental (Home Office) Committee on Lighting in Factories and Workshops. Mr. H. S. Allpress, Mr. J. S. Dow, and others referred to such problems as the lighting of foundries and engineering shops, and at the request of the Chairman a very cordial vote of thanks was passed to the authors for their papers.

Mr. J. S. Dow, who was then called upon to address the meeting, referred to the recent meeting in Manchester, where steps were being taken towards the establishment of a local section. If, as appeared, there was a similar desire on the part of members in Birmingham, he suggested that this might be put on record by the following resolution: "That steps be taken towards the formation of a branch of the Illuminating Engineering Society in the Midland Area, and that this meeting pledges its support to that end."

After this resolution had been put to the meeting and declared carried unanimously, it was agreed that a Provisional Committee, with power to co-opt, should consist of Mr. W. Y. Anderson (convener), Mr. H. S. Allpress, Mr. E. F. Middleton, and Mr. P. J. Watson. A vote of thanks to the Chairman terminated a successful evening.

(A fuller account of this meeting, together with the text of the papers by Mr. Spencer-Johns and Mr. P. E. Shopland, will appear in our next issue.—ED.)

Some Thoughts on the International Illumination Congress

By C. C. PATERSON, O.B.E., M.Inst.C.E.

(*President of the International Illumination Congress.*)

(*Paper read at the Special Meeting of the Illuminating Engineering Society, held at the Manchester College of Technology, Manchester, on Thursday, March 10th, 1932.*)

THE International Illumination Congress of 1932 was a very courageous conception. Only those who have helped to run a Congress know how easy it is to make it sterile by giving its delegates too heavy a dose of technical matter. Its meetings are then not seriously attended, the papers are not comprehended and delegates break up with the feelings of a man who has had an uncomfortable meal with too much food, and ill-cooked at that, and with no appetite with which to try to enjoy it.

This danger has led the organizers of many annual congresses to restrict the sessions to two or three main subjects, the remainder of the time being spent in recreation and unorganized talks.

Such an arrangement works well for a convention of people who are all engaged in the same occupation, for all the attending delegates can then share in such sessions. Our case was otherwise. For it was known that the membership of the Illumination Congress would contain experts on the most diverse subjects.

The chief object of the Congress was to prepare the way for subsequent meetings of the International Illumination Commission in Cambridge, at which some real advance towards international agreement could be achieved. We wanted to make definite progress in such subjects as photometric accuracy, testing and standardization of diffusing materials, method of appraising daylight illumination, an agreed basis for colorimetry, aviation ground lighting, and many other subjects which the ordinary engineer delegates to the specialists, but which are really the fundamentals of our art of illumination.

It is all very well to hold a Congress at the end of which everyone says how nice it has been to meet together. But, after it is all over, and delegates have returned home, people ask what was the real good of it all. Is there real technical and scientific advance to record to compensate for the expenditure of time and money?

With such considerations in view we took the 25 or 30 specific illumination subjects which form the backbone of the work of the International Illumination Commission, and invited papers on them from all over the world. The 110 or more papers received were then arranged in 17 groups, each group to form the more or less homogeneous subject-matter from one session. But to mass such a quantity of good information into three or four consecutive days would have been outrageous. Similarly to rush visitors, who would like to see something of the country, round England and Scotland in a week would be very trying—although this is not infrequently done! So we asked ourselves whether the two could not be combined, to mix travelling and technical sessions, to sandwich physical and intellectual activities, to halt at intervals in our travels in order to hold technical sessions.

To my mind, it was an excellent way of arranging such a Congress, provided it could be efficiently organized. Everyone knows that the real work and results are fostered by the informal talks and discussions outside the conference room. And so it turned out to be. The travelling by coach and train and the visits to places of interest afforded ideal opportunities to exchange views and to establish understandings. By the time we reached Cambridge and met in the inimitable atmosphere of Trinity College for our plenary session there was about us such a spell of harmony and goodwill that agreements were reached which one had hardly expected possible.

So one's first thought regarding the Congress is one of speculation whether we could have achieved anything like the same results with a different and more orthodox plan of organization.

Psychological Effect.

The next thought one feels bound to register is the way in which the Congress triumphed over circumstances. The world had just begun to slip rapidly downhill. Gossip and rumour had been busy all over the world (except in England) with the imminence of a financial crash in this country. Already it was reported things had reached such a pass here that hordes of starving people were roaming about London after food, industry was at a standstill, and nothing could save the country. You all probably saw such statements in Continental papers. Ridiculous as they seem to us, our visitors had no option but to believe them, and wondered to what sort of disorganized country they were coming. To us the crisis in August last had resulted in the sort of feeling of shame which comes to a man the first time he receives notice from the bank that his account is overdrawn. He knows it was a mere accident which he is ready to remedy at once, but he never thought such a thing could happen to him! Men went about feeling astonished and humiliated. Someone rang me up and said: "I suppose you will cancel the Congress now."

What everyone did was to throw redoubled energy into it. What better way of heartening our own people and of showing visitors our real spirit than the floodlighting display which had been so carefully planned? Verily this succeeded beyond our wildest expectations. At one stroke all fears were dispersed, our visitors laughed at the rumours they had brought with them, and the Congress secured such publicity as no Congress has ever had before. Indeed the comments of our visitors were most flattering, and not for the first time they asked that question which we always like to hear: "What is there about the English that they seem to be at their brightest when the world is assembling to attend their obsequies?"

To show I am not drawing on my imagination I would like to read you an extract from an article in the *New York Evening Post* of October 9th of last year. Some may have seen it already, but it is worth looking at twice:—

> "The display erupted at a time of great uncertainty and doubt, when critical decisions were being made to avoid what in many minds presaged national ruin. Britain's pride was going the way of her trade balance. The 'falling house that never falls' was shaken to her foundations. . . . Whatever fortune is in store for London, who can say what courage and pride were distilled among her citizens when they gathered literally in millions to see old glories made young by the unnatural but compelling magic of a spectacular mechanical *tour de force*?
>
> "Moving through the throngs one sensed an almost articulate sentiment of reassurance

bordering on relief. The splendour of London has been endangered before. But it has persisted. These nights it is visible, tangible, in the resourceful Portland stone of which the metropolis is built, the stone which ages so richly into black and white, but which survives so long. Whatever happens to London, London Bridge is not falling down. The glare of remorseless candle-power reveals no cracks."

Hospitality.

And then as we went round the country each centre seemed to compete in showing to the others what British hospitality and organizing ability could do. From our guests came the often-expressed remark: "One never knew what friendly, open-hearted people the British were; why have we got such a wrong idea of them?"

The visit to Sheffield and Buxton, where many Manchester people were able to join in, was no exception.

These things should give us cause to think. Why have we got that national failing of never presenting ourselves, our doings or our aspirations in a way which does us and them even bare justice?

I think all who returned to their homes in Europe did so as enthusiastic missionaries of the gospel of goodwill towards Great Britain. That alone is worth something.

So whether we look at the Congress as a bold and efficient piece of organization or as a buoyant and cheering influence during the few days when the country needed a tonic to its nerves, or as an agency for fostering goodwill towards this country—whichever point of view we take—the Illuminating Engineering Society may be proud of its joint share in the undertaking. You may say this was not all premeditated. True, but we all rose to the occasion and used to the full the opportunity which came to us. That is the real test. For the emergency found illuminating engineers ready to work as a team, and to give of their best in personal effort and goodwill.

Discussions and Decisions.

What is one to say in so short a time of the papers which were read at the Congress and the decisions which were reached at Cambridge? Everyone is naturally inclined to appraise the proceedings in terms of the subject which interests him most. Undoubtedly the one single subject which has attracted the most interest in both the 1928 and the 1931 meetings has been that broad question of *Applied Lighting Practice*. To start with, it enlists the "big battalions" of industry. It is the domain in which we begin to see the commercial and practical results of the scientific labours of the previous years. It covers also those important activities by which schemes of education are launched which shall make the lay public conscious of the advantages of good lighting and discontented with crude and ineffectual methods of illumination. Papers on this subject occupied a whole day in Glasgow, and it is a subject which can hardly receive too much attention, for unless we have an informed public to serve, our efforts towards better lighting will be largely sterile. What is good practice is not always obvious to the public, who think, and rightly think, that lighting is a subject upon which they ought to be able to judge for themselves.

I would like to give you an example. Most of us are distressed to see the tendency in many districts to favour types of street lighting of what one may call an exaggerated directive type. Refractors and reflectors are good, but if they concentrate too much light in a generally horizontal direction towards the midspan position, they introduce a too brilliant light in the field of view of the motor driver. He fails properly to see pedestrians or cyclists who lie in his way beyond the glaring light, and accidents are more likely to happen. Time and again this has been appreciated by district surveyors and engineers who refuse to recommend such systems, but these have been overruled by the lay members of their committees. These men have not yet learnt that the first object of a light is to illuminate the object to be seen and not the eye of the observer. They are attracted by the brilliance of the light, and so insist against better advice on the installation of glaring systems of street lighting. The householder, who does not generally understand the connection between lighting and street accidents, often gives his support, and so for lack of proper education, instead of having good visibility combined with cheerful streets we are getting a lot of bad visibility with garish brilliance. Manufacturers are not entirely to blame, for they must supply what is demanded.

I could say much on this subject, but I only mention it here to show how important is the work of making the public receptive of the ideas underlying better lighting.

Progress.

The aspects of the work of the Congress upon which I personally tend rather to dwell concern not so much these present-day applications, but rather more the work which will show itself in application some few years ahead.

To me it is most encouraging when one looks back over the past twenty years and thinks of the number of problems which seemed almost insoluble, which to-day if not solved are clearly going to be. It makes one confident regarding the baffling and unsatisfactory subjects to-day, for which at present there appears no scientific basis whatever. If we persevere with clear thinking and experiment we shall one day bring these also within the purview of activity of the practical illuminating engineer.

A glance over the work of the 1931 Congress gives ample food for reflections such as these. I can hardly enlarge on all the cases, but may I mention three or four?

Daylight Illumination.

The evaluation of buildings in relation to daylight illumination. I remember the time when the idea of measuring daylight was ridiculed. Daylight was, as it were, an entirely different thing from artificial light—a subject too nebulous and too uncontrolled to be capable of scientific treatment. Besides, no one had to attend to it except architects, and in those days were not science and architecture as far removed as science and religion?

But steady scientific work amongst illuminating engineers and strong support from architects has brought the whole question of appraisement of buildings for daylight to a practical basis. So far had it advanced by the Congress of 1928 that the British delegates put forward in America standard methods of measurement for international acceptance. A measure of agreement was attained, and at the Cambridge meeting in 1931 the subject was completed and a uniform international basis established for all time. We defined clearly the test for interiors which permits us to say if they are inadequate for work under daylight conditions. So the ancient disputes over ancient lights need no longer trouble the courts of law—and architects have a definite "yard-stick" which will establish a figure of merit for interiors. A yard-stick is nearly always the beginning of advances, because with it you can measure progress.

Photometric Accuracy.

Another subject which has bothered illuminating engineers, as well as those who preceded them—under another name—has been the uncertainty of all their measurements. This has always been a reproach and a serious disadvantage. But there was nothing to be done. If a greater accuracy than 2 or 3 per cent. was wanted, even under favourable laboratory conditions, it meant several repeat readings with more than one observer. If an accuracy of one-half per cent. were required one sat down for a good week's work. How different the outlook now!

In a paper presented to the Congress it was brought home that with photoelectric cells and methods an accuracy of 1½ per cent. is easily obtainable with commercial photometry—and with speed in working. The constancy of commercial lamps themselves is hardly greater than this. But the advance is not merely measured by this figure of accuracy. The photoelectric method can be arranged to give a high accuracy over a considerable range of colour, so that instead of having, as previously, to have several observers and take the mean to eliminate the personal photometric error, one setting by one observer now suffices. Those who do not work in the laboratory may not realize the avenues that this opens up in making possible statistical investigations involving photometric results. Such efforts previously could scarcely be reconciled with logical deductions.

It can only be a matter of time now before these methods are applied to illumination photometers for street use, and we shall be saved the humiliation of having to say that our measurements of illumination in the street cannot be trusted to within plus or minus 10 per cent. or 15 per cent. This is at present a serious matter. The British Street Lighting Specification, which was at first mainly used to assist in the purchase and sale of street-lighting installations, is now beginning to be seriously applied by public works authorities to their maintenance undertakers. This means that before long every city which takes its street lighting seriously will require its installations to be maintained within a certain definite limit of their rated values. Such requirements will have to be determined systematically by street measurements. Hence the vital importance of developing methods the accuracy of which are beyond doubt.

It is hardly too much to say that the whole question of the really effective maintenance of street lighting depends upon our ability to improve greatly on the accuracy of our present methods of street measurements. This is a need which a few years ago would have been declared impossible of fulfilment. To-day it is a virtual certainty, although not actually in its practical form.

Aviation Lighting.

One finds in the subject of aviation lighting a different sort of satisfaction. I feel it does credit to all concerned. There was sufficient statesmanship three years ago in different countries for a few experts to see that aviation lighting was a subject requiring standardization, before practice became crystallized differently in different countries. They approached the International Commission, and a special meeting was held in 1929 in Berlin. Efforts towards a uniform practice were launched, and last year, in Cambridge, a working foundation was agreed upon by all countries which will ensure for all time a uniform system of light signals for night flying throughout Europe. This applies particularly to ground lighting for aerodromes and route beacons; but it also proposes to the governments the scientific system for defining navigation lights in terms of candle-power, in contradistinction to the principle followed hitherto at sea and in the air of saying at what range the lights shall be visible. This may *sound* the right thing to say. But visibility needs interpreting by some authority, and it is much better to define navigation lights internationally in terms of candle-power which everyone can measure.

Had this been the only thing the Congress achieved it would have been worth while. I don't think we always realize the enormous legacy in saving money and confusion which we bequeath to the years to come when we secure uniformity and standardization before it is too late in the essentials of any field of activity. I don't know of any blemish in this direction on the escutcheon of the gas industry. There may be—anyway, if there is they only talk about it in private. But just think of the money and confusion which would have been saved if, 35 years ago, electrical engineers had fixed on one standard voltage for consumers' premises. In the early days one conference at a cost of £100 or so would have saved it all. Some day, millions of pounds have got to be spent rectifying the omission. This, though, is not part of my subject this evening.

Diffusing Glassware.

There is another problem which has always baffled the illuminating engineer in the laboratory. He has been able to devise no satisfactory tests for proving the effectiveness for practical purposes of diffusing glassware. The practical man has taunted him that in buying and selling opalescent glassware he is left to guess and judge amongst ineffective empiricisms. No one could tell the manufacturer what to aim for in his opal glass, and no one could lay down a specification which the buyer could understand and use.

Again, in this matter this country has taken a leading share in reducing the subject to scientific and commercial order. The proceedings of the Congress witness to the impending solution of this problem. Theoretical and practical investigations on the scattering of light by diffusing media have enabled a mental picture to be formed of what goes on inside a piece of opal glass; how the particles which produce the scattering are (in the most efficient glasses) small transparent spheres about one ten-thousandth of an inch in diameter, scattering the light by reason of their smallness and because their refractive index is different from that of the glass in which they are suspended. But the investigations have led us further. It is now possible to predict from a knowledge of the number and size of the particles in a given glass the absorption, transmission, reflection and diffusion characteristics of that glass, whether it be in the form of flat sheets or in the form of the popular totally enclosing opal globe. And this has a corollary, for if it is possible to predict these constants it is also possible to examine a specimen of opal glass in one form and to foretell its performance in some other form.

Let us consider for a moment the value of this to the illuminating engineer. Diffusing glassware has a twofold value in lighting—it serves as a medium for decorative treatment and it serves as a method of overcoming the danger of glare from sources of high brightness. But whatever the use of the glass, it should operate with the minimum loss of light, and this is where the problems begin.

If a diffusing glass is to be used for the purpose of avoiding glare it is essential that it should diffuse correctly. We are probably all familiar with the type of opal through which the light-source can be seen as a reddened image. Such glass is only partially diffusing the light, and if the brightness of the image

which can be seen is allowed to reach high values the function of the glass will have been destroyed. In view of this it is now almost universally accepted that for an opal glass to be effective it must not permit an image of the source to be seen through it.

That is qualification one. The second qualification is that the amount of light lost in the glass should be a minimum. This is naturally in direct opposition to the first requirement, for it is a comparatively simple matter to make a diffusing glass so dense that it will completely obscure the light-source, providing there is no limit to the amount of light which is lost in passing through it.

In the construction of an opal-glass lighting unit yet another factor enters—the thickness of the glass. There is a minimum thickness at which an opal-glass unit will have adequate mechanical strength to withstand the shocks it will inevitably get in transit and service. So the problem of the opal glass maker has become the construction of a glass of adequate thickness for mechanical strength, of sufficient diffusion to prevent the source being seen through it, and of low absorption. Whilst the *problem* has probably remained unchanged for some considerable time, present-day *solutions* are very different from those of a few years ago.

Nowadays, when an opal fitting is made, it is possible to test the fitting as a whole for its efficiency (a test usually made in some form of integrating photometer), and it is also possible to test the quality of the opal glass as a diffusing medium. To do this thoroughly it is necessary to break up the unit and to test individual samples of the glass for absorption, transmission and reflection. From these figures it is possible to calculate the diffusing power of the glass, its absorbing power, and certain other optical constants (these have no physical meaning, so I can't describe them) which it possesses. This having been done it becomes possible to predict the minimum thickness of the glass required for adequate obscuration of a given light-source, and the efficiency of a unit made with the same glass to this thickness. Should this prove unsatisfactory for one reason or another, it is possible to determine whether the particle size or number should be changed, and if any such changes are made what the effect will be.

The effect of these developments on the quality of opal glasses obtainable at the present time may be judged from some performance figures. In small bulbs, as used in the manufacture of electric lamps, a good opal bulb may have only 8 or 9 per cent. greater absorption than the clear glass bulb, although there is sufficient scattering to obscure completely the image of the filament. In larger units of the totally enclosed diffusing type, the absorption will be slightly higher, but it is only of the order of 12 to 13 per cent. in the case of a high-quality opal, although the effective brightness of the source has been reduced from 3,500 to under 5 candles per square inch. Many of us are familiar with opal glasses with more than 30 per cent. absorption.

Colorimetry.

May I mention just one more direction in which great progress was made at last summer's meeting? It was in the art of colorimetry. There has hitherto been no standard method of measuring and expressing colour. We have described colour as cerise, old gold, terra-cotta, and so forth, but these are names each of which covers a group of hues. We have for instance to define the colour of signal glasses in some way which will enable them to be repeated exactly.

There have been systems for doing this—such as Munsell's and others—most of them fairly satisfactory for the limited scope for which they were intended, but unsuited for broad universal use.

There have for years been two possible comprehensive systems. But they have in a measure been rivals; one system had convenience, but was not so complete—the other was fundamentally sound, but appeared more complicated. So amidst the indecisions of experts technical progress has rather floundered. The Cambridge meeting of the Commission saw a reconciliation of views. Agreement upon a fundamental basis was established.

May I explain the issues in quite simple terms? One system of measuring and defining colour is based on the fact that, in general, colour can be matched by mixing a certain quantity of white light with a suitable quantity of monochromatic light of some one wavelength. Having found this wavelength and measured its intensity, and having also measured the intensity of the white light to be mixed with it, the colour is defined and can be reproduced. A colour which requires no white light with it to make a match is called a saturated colour. The system is scientific and often convenient. It was not, however, chosen as the fundamental one.

The other, chosen as the standard colorimetric system, was based on the fact that every colour can be matched by the combination of suitable amounts of three definite spectral colours. The wavelengths of these three spectral colours were defined at Cambridge, as well as the temperature of the incandescent body which is to provide the white light to illuminate the colour under examination. This is putting the matter in very simple terms.

Believe me, it was a great triumph to achieve an agreement, for the protagonists held their respective views as strongly and as honestly as any religious devotee his dogmas, with perhaps the difference that they *wanted* to agree.

Conclusion.

I have given sketches of some of the subjects in illuminating engineering which seem to me to owe very much to the International Illumination Congress of 1931. The list is not complete, but I am hoping this necessarily inadequate review suffices to show that there are those in all spheres of activity—Industry, University and Government Establishment—who are working with statesmanlike patience to smooth the way of the everyday illuminating engineering of to-morrow.

But there is one influence which I have said little about.

This evening we meet under the guidance and patronage of the Illuminating Engineering Society—the organization which has done so much to foster all illumination activities during the past 25 years in this country. But I should like to say more than this. It stands to me for an influence for goodwill and harmonious interworking with other and allied activities—a harmony which is characteristic of the whole group of men who throw their interest and brains into this subject. It is one of the happiest spheres in which to work.

And this evening we have the great satisfaction of taking part in a meeting of what we hope is to lead to the first, but not the last, branch of the Illuminating Engineering Society to be formed. It is appropriate if this should be in the City of Manchester. I am asked to say from the Council of the Society in London how glad the members there are to hear of this meeting and of your desire to establish a branch in Manchester. They welcome this movement of yours most cordially. They hope it will be for our mutual strengthening, and that it will be followed by a similar initiative in other cities.

The Lighting of Churches and Cathedrals

(Proceedings at the Meeting of the Illuminating Engineering Society, held in the House of the Royal Society of Arts, 18, John Street, Adelphi, London, W.C., at 6-45 p.m., on Friday, February 19th.)

DISCUSSION

(Continued from p. 73, March, 1932.)

FIG. 1.—Canterbury Cathedral. A view of the Nave by artificial light.

FIG. 2.—Canterbury Cathedral. Another view of the Nave by artificial light (looking East).

The CHAIRMAN (Lieut.-Commander Haydn T. Harrison) said that during the last twelve years he had been called upon to advise on the artificial lighting of several churches and some of the most beautiful English cathedrals. He thought it possible that his experience might assist those now dealing with this work.

He had come to the conclusion that every building of this class required special treatment and should be handled by experienced illuminating engineers, as the ordinary methods of lighting could rarely be applied. In the case of Canterbury Cathedral, of which views of the nave, from the east and west ends, had been shown on the screen (Figs. 1 and 2), the rosettes in the Gothic roof, over 80 ft. above floor level, might have been specially designed for the purpose of receiving concentrating reflectors. He had used these with suitably designed reflectors containing 500-watt lamps and had obtained 2.5 to 3.0 foot-candles at the floor level, at the same time illuminating all the beautiful architectural features from floor to apex, thus obtaining results which had been universally admired. The choir and chancel were lighted in the same way. The local lights at the choir stalls and clergy seats, and some of the congregation pews, were used when only a small congregation was present.

Norwich Cathedral, of which both daylight and artificial illumination had been shown, was a very different proposition, but in this case the architectural features allowed of suitable positions being found where the light-sources were invisible to the congregation; thus it was possible to produce the results shown, which it would be noted very closely resembled daylight, and, in fact, did result in a higher illumination even in the choir, though the dark oak there tended to produce the effect of lower illumination. (See Figs. 3 and 4.)

The degree of illumination necessary was generally the subject of much dissent among the clergy. In the case of Canterbury Cathedral he had installed dimmers to endeavour, by testing, to obtain some basis on which to work. The result was that except when a large number of the public were present, a low illumination (about 1 foot-candle) was generally preferred; a preference was also shown for the more yellow light of the under-voltage lamp.

As regards church lighting, unfortunately he had no illustrations to show, as night photographs were not available. In 1920 he decided to light a church with a roof construction similar to that of Bearsted Parish Church (of which Mr. Ackerley had shown a beautiful illustration) by means of concentrating reflectors, pointing slightly eastward, fixed to the east side of the cross-beams, and thus out of sight of the congregation. This was such a success that he had often used the same plan, and many other churches had followed suit.

There was no doubt that in the case of old ecclesiastical buildings, where artificial lighting was not considered in their design, concealed light-sources were most satisfactory. In modern buildings where the architect had dealt with the matter in his plans, and was able to produce a design or a form of fitting which added to the beauty of the building (and could be adapted to the purpose of lighting), much could be done, but no doubt architects would agree with him the problem was not easy.

FIG. 3.—Norwich Cathedral (daylight view). (*Lieut-Commander Haydn T. Harrison*).

FIG. 4.—Norwich Cathedral (the same view by artificial light. (*Lieut.-Commander Haydn T. Harrison*).

Mr. ARTHUR BLOK said that he thought the meeting might be interested in hearing something of a building which, perhaps, is a curiosity inasmuch as it is one of the few buildings in London which are still lighted by wax candles, and in this respect it certainly had some bearing on what had been said at the meeting regarding the employment of low values of illumination in religious edifices.

The building to which he referred, and the general lines of which he sketched on the blackboard, was the Synagogue of the Spanish and Portuguese Jews in Heneage Lane, Bevis Marks, London. It is a plain, lofty, rectangular building with a flat ceiling, and a broad gallery running around three sides—apart from the pillars which support this gallery, there are no arches, cornices or other features of interruption. It was built in 1701* and is modelled on the extraordinarily plain and dignified lines of the similar synagogue in Amsterdam.

Until quite recently it was lighted solely by wax candles carried in a series of impressive brass Dutch candelabra hanging from the ceiling and assisted locally by candlesticks on the railwork around the gallery and candle brackets on the walls at the back of the gallery. The lighting effect of this very large number of wax candles was remarkably mellow and pleasing, but undoubtedly insufficient in view of the fact that Hebrew print in any ordinary prayer-book contains many minute symbols and pointings which are difficult to see even with a good illumination. It was accordingly decided to add a modicum of electric light to the candle light, and the difficult problem arose of doing this without impairing the harmony of style in the relatively ancient building or introducing a strident note by over-illumination. It was decided—and, in the speaker's view, very rightly decided—that to have converted the magnificent candelabra by wiring them electrically would have been an act of vandalism. A variety of alternatives was accordingly tried. In the end the problem was solved by fitting around the tops of the pillars which support the gallery bands of brass carrying electric candle arms made *en suite* with the Dutch pendants, and so arranged as to increase the illumination under the gallery and on the central floor area in the body of the synagogue. Also, the wax-candle brackets on the gallery walls were converted so as to take electric-candle fittings, and a few extra electric-candle fittings were fitted locally in particularly dark regions, such as the canopied "banca" or pew used by the wardens.

* See Vol. IV, "Survey of Royal Commission on Historical Monuments." (H.M. Stationery Office.)

For ordinary services the electric light only is used, and gives a quite sufficient illumination, while for the High Festivals the wax candles are used together with the electric candles, and the effect is indeed impressive. Notwithstanding the very large number of small sources scattered throughout the building, some twinkling and some steady, the

FIG. 5.—A view of Bevis Marks Synagogue, showing candelabra. (*Mr. A. Blok*).

general impression is harmonious and beautiful. As examples of the actual illuminations obtained before and after the addition of the electric fittings, the following are representative:—

Location	Foot-candles with wax candles only in use	Foot-candles with wax and electric candles in use
Centre point of floor ..	0·5	1·1
Left-hand aisle, opposite one of the pillars ..	0·3	1·8
Under gallery edge, seat midway between two pillars	0·18	2·8
Under gallery, seat at back wall	0·13	1·4

(All readings taken in horizontal plane, 1 metre above floor)

The average illumination in the horizontal plane with all lights in use is certainly not much above 2 foot-candles, which in the opinion of many would be too low. But the fact remains that everyone can see well enough to read, and the congregation is satisfied. And this has been achieved by a reason-

able compromise which has preserved the character of the building in a perfectly seemly manner.

Mr. HICKS remarked that the question of the lighting of churches had scarcely been considered from the point of view of the congregations attending. The remarks of previous speakers had been directed rather to the lighting of the architecture. The fact must be borne in mind that the people attending churches were not always interested in the architecture—that applied especially to certain occasions such as weddings and funerals. In conclusion, the speaker referred to the lighting of a very beautiful vault in the west wing of St. Peter's, Ealing, where four gas burners had been installed.

Mr. L. M. TYE said that the introductory papers had been exceedingly interesting. He wished, however, to mention a point which, so far, had not been raised, namely, the attitude of the Advisory Committees on Church Lighting appointed by the various dioceses throughout the country. There were already many examples of concealed church lighting in existence, and he thought that illuminating engineers were agreed that probably 75 per cent. of church-lighting problems could be dealt with on that basis. They were, however, confronted by the fact that the majority of the diocesan advisory committees seemed to be absolutely opposed to the principle! A most definite indication had been given in that direction by one of the readers of the papers. He thought this attitude required explanation. On the other hand, the lighting engineer was quite prepared to be guided by the architect in regard to the points selected for lights, and there were many other questions on which they would be glad of a little more collaboration with the architect.

It had been noticed in many instances that an illumination of 2 foot-candles had proved to be quite satisfactory in exceedingly large churches. He thought there was a tendency to over-illuminate churches of this character, where differences in brightness seemed to produce a much more marked visual effect than in the case of small churches. Thus the effect of an increase from five to six candle standard was then not so apparent as when dealing with a very extensive system of lighting.

Mr. A. W. BEUTTELL remarked upon the added interest that had been introduced that evening by the reading of a series of short papers followed by several addresses. He hoped that the same course would be adopted in the future on suitable occasions.

Some interesting lines of thought had been indicated as the result of these papers. Mr. Howard Robertson they knew as an architect who was sympathetic towards the progress of modern lighting. It was considerate of him to absolve illuminating engineers from the duty which had been imposed upon them by some architects in connection with shadow effects. But he was not sure that the vast majority of architects probably would agree with what had been said on that point.

Church lighting had to be regarded from the point of view of the early days of Christianity, when churches were first built. It was perfectly true that to-day most cathedrals and big churches were in a sort of holy gloom after daylight hours. While it had somehow come to be assumed that gloom was a necessary concomitant of divine worship, he very much doubted whether this was a true reflection of human nature. He rather thought that when the first churches were built the builders of those days introduced as much light as they could into the buildings; but the sources of light at that time were necessarily small and the churches were not built for the use of modern illuminants.

Was not the general underlying idea with regard to churches and cathedrals the fact that architects and the leaders of religion were out to convey, so far as they could, the majesty of the Deity, and in an endeavour to express that feeling had made interiors of very great beauty? He very much doubted whether the architect of those days was able to visualize the effect of shadows on all the different elements that went to make up the buildings. It seemed more likely that the architect did not design the interiors of buildings with a clear picture in his mind of what the interior of the building would actually appear like when it was completed, but made the interior as beautiful as he could, just as he did the exterior, which would receive ample light from all directions. He thought that they should get away from the idea that there was a natural innate demand for any particular effect. There were beautiful interiors decorated from floor to ceiling. Let them be illumined by any and every means that would show the details of the architecture to the best advantage.

Mr. P. S. BARTON said that the remarks that had been made on the subject of intensity raised the question in his mind that the intensity required on the walls of buildings might possibly be in the order of 2 foot-candles. The illumination required to enable people to read books comfortably might be of the order of 10 foot-candles, so that an intensity quite different from that which was applied to the walls would be necessary at floor level. It was probably true that at the present time the walls in many cases received more illumination than the pews. This process might have to be reversed.

It seemed that architects were divided in their views. Many of those who were in favour of drop-pendants were quite prepared to put in designs in keeping with the style of the building. He thought that those who favoured concealed lighting should help illuminating engineers by furnishing natural housing for concealed light points. At present the introduction of points for concealed lighting was regarded as an unsightly and foreign element, and these were the subject of apology.

Mr. HOWARD ROBERTSON did not think that what had been said with regard to the desirability of good visibility in churches and a good deal of light as a natural thing in a church was correct. The priesthood from ancient times up to the present day had been in favour of dimness in churches, as it undoubtedly produced a psychological effect on congregations. Egyptian priests in ancient times certainly had an eye to power, and the more dim the interior of a religious building was the more mysterious was the power of the priest. He did not express an opinion as to whether or not it was a good thing that priests should obtain such power, but he believed that dimness was deliberately intended.

The CHAIRMAN remarked that in the finest churches in the world one found stained-glass windows; this fact seemed to suggest that a dim light in a church was considered the correct thing.

Mr. A. W. BEUTTELL thought that Mr. Howard Robertson was right in what he said with regard to dimness in very ancient churches with a view to the power of the priesthood—but that surely did not apply to-day. There was now a very different outlook and aspect with regard to religion. He did not think that present-day people looked for dimness in religious buildings. He thought that we were progressing to the point where a bright religion would be more acceptable than it would have been in ancient days. Were they not entitled to say that,

FIG. 6.—A church illuminated by fittings arranged round the capitals of the pillars. (*Mr. W. G. Brooker*).

FIG. 7.—The same church equipped with concealed lighting. (*Mr. W. G. Brooker*)

with daylight intensities outside churches, reasonably high foot-candle intensities should be attained inside, even where there were stained-glass windows?

Mr. W. G. BROOKER (*communicated*): Most denominations have their churches constructed on their own particular lines in order to be in keeping with their beliefs. It follows, therefore, that the method of artificially illuminating them differs owing to the difference in construction—if for no other reason. It will nevertheless be found that the majority of churches lend themselves extremely well to concealed lighting, and many installations are being carried out on this basis.

The predominating type of church has a high nave with side aisles, the roof being supported by two rows of pillars from which arches spring, terminating with the triforium or clerestory and roof. The walls, pillars and triforium or clerestory are usually of light-coloured stone having a fairly good reflecting value, while the roof, consisting of timber supported by beams and buttresses, is usually black, or almost so, and therefore cannot be used for reflection purposes.

Church lighting plays an important part in creating a correct atmosphere. It should not convey the depressing effect of a low ceiling (which is usually associated with lighting systems which still exist in a large number of churches), and it is, therefore, necessary to illuminate the upper part of the church in order to overcome this difficulty. Thus, undoubtedly, a well-diffused quality of illumination is required in order to produce an effect as closely akin to daylight as possible. At the same time the light-sources should be concealed in order not to distract attention. The desired effect can be obtained quite simply by means of diffusing reflectors, such as are easy to install and adjust, and whose maintenance is easy.

Fig. 6 shows a typical church illuminated by fittings arranged round the capitals of the pillars. This arrangement results in patchy illumination and glare and gives the effect of a low roof. Unfortunately, this illustration is reproduced from an excellent photograph of a bad installation, and this last point is not nearly so evident from the picture as when one is actually in the church itself!) Apart from the glare, it will be noted that the shadows are reversed, the under-side of the arches, etc., being illuminated to a comparatively high value.

There seems to be an impression among conservative church-goers that good lighting detracts from the atmosphere of "mystery," to which they attach so much importance. Surely, this view is not justified. It must surely be better to read in comfort rather than strain one's eyes by endeavouring to read small print by a quite inadequate illumination.

Fig. 7 shows the same church illuminated by the concealed method. Enamelled-steel elliptical-angle reflectors equipped with 150-watt lamps are mounted on the east side of the roof-trusses close to the walls, and the light is projected diagonally across the nave. While the majority of the light is projected in a downward direction to the pews below, a certain amount is spilt on the arches and triforium on the opposite side of the nave, and these being of light-coloured stone reflect sufficient light upwards to eliminate the depressing effect of an apparently low roof.

The same system is applied to the side aisles, the elliptical-angle reflectors being mounted on the other side of the triforium throwing their light in a downward direction diagonally towards the walls. Here again the roof receives sufficient light by reflection from the walls, which, like the arches and triforium, are of light stone.

The chancel required slightly different treatment, as light was required at higher angles in order to cover uniformly the whole of the east wall of the chancel. Parabolic-angle reflectors were accordingly chosen so as to give a wider distribution in the vertical plane. The chancel, being the most important part of the church, demanded a slightly higher value of illumination than the nave and aisles; 200-watt lamps are accordingly used. In addition, two special reflectors are installed to produce a maximum illumination on the altar. It was necessary to install pearl lamps in order to obtain a sufficiently diffused beam to merge with the diffused light from parabolic-angle reflectors. This view conveys some impression of the excellent uniformity of illumination obtained in the church. The illumination obtained on the plane 3 ft. above the floor is 4 foot-candles.

Mr. H. C. WHEAT, briefly replying to some of the points raised in the discussion, said that his remarks had referred primarily to old buildings. There was naturally a distinct difference between the method of lighting suitable for a building erected 100 years ago or more and one erected yesterday (or about to be put up to-morrow). In such cases it was hoped that architects would allow illuminating engineers to work with them, and, where the architect was willing to make the necessary provision, to render the lighting part of the general scheme of decoration.

The Application of Electric Light to Agriculture

(Proceedings at the Meeting of the Illuminating Engineering Society, held at the House of the Royal Society of Arts, 18, John Street, Adelphi, London, W.C.2, at 6-45 p.m., on Friday, March 18th, 1932.)

A MEETING of the Illuminating Engineering Society took place in the House of the Royal Society of Arts (18, John Street, Adelphi, London, W.C.2), on Friday, March 18th, 1932. Members assembled for light refreshments at 6-45 p.m., and at 7-15 p.m. the chair was taken, in the absence of the President, by Mr. Justus Eck.

After the minutes of the last meeting had been taken as read, the Chairman called upon the Hon. Secretary to present the names of new applicants for membership, which were as follows:—

Sustaining Members:—

Brighton Corporation Electricity Supply Undertaking. *Representative*: Mr. N. C. Clinch, North Road, Brighton.

Brompton & Kensington Elec. Supply Co. Ltd. *Representative*: Mr. R. S. Downe, 254, Earl's Court Road, S.W.5.

Corporate Members:—

Bannister, J. D. .....Lamp Specialist, General Electric Co. Ltd., 24, South Down Crescent, Cheadle Hulme, Stockport.

Mottram, L. .....Branch Manager, London Electric Wire Co. & Smith Ltd., 19, Brazennose Street, Manchester.

Stephens, J. N. .....Director, Edison Swan Electric Co., 123, Queen Victoria Street, E.C.

Foreign Member:—

Lespoule, E. H. .....Ingenieur en Chef de l'Exploitation, Compagnie Parisienne de Distribution d'Electricité, 23, Rue de Vienne, Paris.

The names of those presented at the previous meeting on February 19th were read again, and these gentlemen were formally declared members of the Society.*

The CHAIRMAN then called upon Mr. F. E. Rowland to deliver his paper on "The Application of Electric Light to Agriculture." In the introductory portion of his address Mr. Rowland dealt with the development of electric lighting in rural areas and its general applications on the farm, describing the approved methods of lighting milking sheds, dairies, stables, and other farm buildings. The nature of fittings and wiring for such purposes was described, after which the author proceeded to discuss in detail the use of light in the poultry farm and the effects of various systems in improving the output of eggs throughout the winter months. In conclusion, a brief reference to the ultra-violet irradiation of poultry was made. The paper was illustrated by numerous lantern slides, and at the conclusion of the address a film, illustrating the application of electricity on a typical farm, was shown to the audience.

The discussion was opened by Mr. R. BORELASE MATTHEWS. Amongst others who took part were Mr. E. STROUD (who presented a communication dealing with the use of light in horticulture), Mr. F. C. RAPHAEL, Mr. J. MARKHAM, and the CHAIRMAN (Mr. J. Eck).

After Mr. Rowland had briefly replied to some of the points raised in the discussion, and had been accorded a cordial vote of thanks, it was announced that the next meeting of the Society would be held on April 26th, when Mr. Penwarden would deliver a paper dealing with "The Development of Decorative Lighting."

(The paper by Mr. Rowland and the ensuing discussion will be dealt with fully in our next issue.—ED.)

Workshop Lighting

In a lecture on the above subject given before the British Works Management Association in London, on February 18th, Mr. E. L. Oughton remarked that modern industrial economics demand an ever-increasing efficiency, not only as regards maintenance of output but also in respect of quality. Scientific illumination is of vital importance from this standpoint, as well as in relation to avoidance of eyestrain, and benefits both employer and employee.

Mr. Oughton recalled some of the visits to factories arranged in connection with the International Illumination Congress last year. In some works modern gas or electric lighting could be seen; but in some other cases appalling examples of obsolete lighting conditions were witnessed by visitors from abroad. It was necessary to understand what was involved in good lighting. Importance was attached to such points as the elimination of glare and the provision of illumination adapted to the needs of particular processes. Mr. Oughton also referred to the important part played by reflection of light from walls, ceilings, and even parts of machinery which might with advantage be painted light grey in preference to black. He alluded to the obstructive effect of large and intricate machinery, and mentioned cases where supplementary local lighting was needed. He also emphasized the important part played by the colour of the working material in determining the requisite illumination, and the value of "artificial daylight" in trades where accurate colour matching is involved.

* *Illum. Eng.*, March, 1932, p. 63.

Twenty-Fifth Illumination Design Course

The above course will take place during May 2nd to May 5th at the Lighting Service Bureau (14, Savoy Street, London, W.C.2.), from whom all particulars may be obtained. Following registration on Monday morning, May 2nd, there will be a reception by the Director of E.L.M.A., Mr. C. W. Sully. The opening address by Mr. R. C. Hawkins will be on "Twenty Years of Scientific Illumination." Over twenty additional addresses are on the list, amongst which may be mentioned "Light and Vision" (W. J. Jones), "Factory Lighting Design" (T. Catten), "A New Outlook in Shop Lighting" (F. Marsh), "Colour Lighting" (R. O. Ackerley), "Floodlighting" (H. Lingard), and "Architectural Lighting" (Waldo Maitland). Numerous interesting visits to electricity showrooms, theatres and industrial lighting installations have been arranged. The course promises to be quite as interesting and successful as those held in the past, and is well worth the attention of those in the electrical industry who wish to get an up-to-date and concise survey of modern lighting problems.

Competition of Industrial Designs

We have received a notice of the above annual competition, organized by the Royal Society of Arts (John Street, Adelphi, London, W.C.2), from whom details of scholarships and prizes may be obtained. Applications for entry forms must be received between May 2nd and May 9th, and the last day for receiving entries is May 21st. Lamp standards and electric lighting fittings figure amongst the subjects for design, which cover a wide field.

Literature on Lighting

(Abstracts of recent articles on Illumination and Photometry in the Technical Press)

(*Continued from p. 78, March, 1932.*)

Abstracts are classified under the following headings: I, Radiation and General Physics; II, Photometry; III, Sources of Light; IV, Lighting Equipment; V, Applications of Light; VI, Miscellaneous. The following, whose initials appear under the items for which they were responsible, have already assisted in the compilation of abstracts: Miss E. S. Barclay-Smith, Mr. W. Barnett, Mr. S. S. Beggs, Mr. F. J. C. Brookes, Mr. H. Buckley, Mr. H. M. Cotteril, Mr. J. S. Dow, Dr. S. English, Dr. T. H. Harrison, Mr. C. A. Morton, Mr. G. S. Robinson, Mr. W. C. M. Whittle and Mr. G. H. Wilson. Abstracts cover the month preceding the date of publication. When desired by readers we will gladly endeavour to obtain copies of journals containing any articles abstracted and will supply them at cost.—ED.

I.—RADIATION AND GENERAL PHYSICS.

70. Studies of Ultra-Violet in Daylight. H. B. Meller, S. G. Hibben and Mary E. Warga.

Am. Illum. Eng. Soc., Trans., 27, pp. 65-80, Jan., 1932.

Several methods of measuring natural ultra-violet are discussed and an account presented of an investigation under the auspices of the Mellon Institute of Industrial Research relating chiefly to air pollution and health. The use of the integrating ultra-violet meter is described and typical chart records analysed. G. H. W.

71. Variations of Intensities of the Visible and of the Ultra-Violet in Sunlight and in Skylight. W. Kunerth and R. D. Miller.

Am. Illum. Eng. Soc., Trans., 27, pp. 82-94, Jan., 1932.

The paper deals with the experimental determination of the amounts of light received from the sun at 42° N. latitude at various hours of the day throughout the year, both in the visible spectrum and in the ultra-violet, and what per cent. of the total comes from the sky alone in each of these two regions of the spectrum. Atmospheric absorption is dealt with and the amount of ultra-violet coming from different sections of the sky considered.

G. H. W.

II.—PHOTOMETRY.

72. The Photographic and Visual Determination of Direct Daylight Factors. A. C. Stevenson.

Journal of Scientific Instruments, Vol. IX, No. 3, March, 1932.

A method is described by which direct daylight factors can be obtained directly from photographs, or from images projected on a ground-glass screen, by means of suitable grilles. These may also be used for the prediction of direct daylight factors.

W. B.

73. A Camera for the Measurement of the Brightness of the Sky at Night. Friedrick Schembor.

Zeits für Instrumentenkünde, No. 2, pp. 78-80, Feb., 1932.

The author describes a camera for the simultaneous measurement of sky-brightness at eleven different points of the sky, from the zenith to 80° on either side in any given vertical plane. The camera, in the form of a cylindrical drum, is equipped with eleven pin-holes round part of the periphery. The pin-holes are 3 mm. in diameter, and are opened and closed by a sliding band controlled by a knob. Ordinary kinematograph film is used. The density of the photographs obtained is measured with a Hartmann microphotometer to determine the sky-brightness at each point. The azimuth of the instrument can be read off on a dial. L. J. C.

74. Photo-cells: The Valves which Operate by Light. Clifford C. Paterson.

Journal of Scientific Instruments, Vol. IX, No. 2, Feb., 1932.

A discourse given at the twenty-second annual exhibition of the Physical and Optical Society. The lecture deals with the four types of photo-electric cell: (1) The selenium cell and its congeners, (2) the alkali-metal cell, (3) the electrolytic cell, and (4) the dry-plate rectifier cell. A brief description of each type is given and the types are compared. A photo-electric colour bridge—as used to determine very accurately whether the light from two incandescent lamps is of the same colour—is described, and a diagram of connections is given. Among other factors dealt with are (1) time lag of cells and (2) thermionic and photo-electric emission. W. B.

75. A New Polarizing System for Spectrophotometers. J. H. Dowell.

Journal of Scientific Instruments, Vol. XIII, No. 12, Dec., 1931.

The effect of scattered light in the Nicol prism is discussed, and an improved form of prism in which such light is much reduced is described. The author also describes an improved polarizing system for spectrophotometers consisting of three nicols in tandem, the first and last being stationary and arranged to transmit light polarized in the same plane, the second prism arranged to rotate. In such a system it is shown that the ratio of intensity follows the law $I_1/I_2 = \tan^4 \theta$. The theoretical advantages of the system as compared with the usual system consisting of one fixed and one rotating nicol, in which the ratio of intensity follows the $\tan^2 \theta$ law, are also discussed. W. B.

III.—SOURCES OF LIGHT.

76. Influence of Voltage Fluctuations on the Life of Incandescent Lamps. L. Piasnik.

Licht u. Lampe, 5, p. 63, 1932.

The relation between the normal life of the lamp and the shortened life due to voltage fluctuations is worked out mathematically for different types of fluctuation. E. S. B-S.

77. A New Mercury Vapour Lamp of Glass or Quartz for the Laboratory or Workshop. W. Hanies and A. V. Hippel.

Phys. Zeits, 33, pp. 81-85, Jan., 1932.

A new type of mercury-vapour lamp is described and its properties enumerated. This lamp has the following advantages: The luminous portion, made of glass or quartz, gives a source of light in the form of a strip of high surface brightness; the lamp arcs automatically and burns with very small consumption of watts with correspondingly trifling development of heat. The arc burns very steadily and reproducibly for any position of the lamp, and the lamp is therefore easily mounted for any type of work. The lamp is cheap to buy and to run; and its mean life is 1,000 hours. T. H. H.

78. Ultra-Violet Equipments and their Applications. L. C. Porter, C. E. Egeler and W. Sturrock.

Am. Illum. Eng. Soc., Trans., 27, *pp.* 23-61, *Jan.*, 1932.

The paper describes the latest sources of ultra-violet and presents design data regarding equipment to control its distribution. Recommendations are also made regarding the installation of such equipment, and the advantages of ultra-violet in poultry husbandry are discussed in detail. G. H. W.

V.—APPLICATIONS OF LIGHT.

79. Airways Lighting. D. C. Young.

Am. Illum. Eng. Soc., Trans., 27, *pp.* 189-207, *Feb.*, 1932.

Full details are given regarding American practice in this field of lighting, including recommendations for the lighting of various types of obstructions. The various types of lighting equipment in general use are described and illustrated, and the lighting of intermediate landing fields is discussed. Several new developments contemplated for the future are listed. G. H. W.

80. Airport Lighting. K. W. Mackall.

Am. Illum Eng. Soc., Trans., 27, *pp.* 123-164, *Feb.*, 1932. (*Internat. Illum. Congress Paper*, 143.)

Information on the rating of airports is given, and the author describes the essential elements of the various types and makes of lighting equipments, and where possible shows the light distribution produced by each in addition to a photograph of the unit. Complete information on lamps is presented and recommendations made for locating the flood-lighting equipment. G. H. W.

81. Airplane Lighting. R. W. Cost.

Am. Illum. Eng. Soc., Trans., 27, *pp.* 165-188, *Feb.*, 1932. (*Internat. Illum. Congress Paper*, 143.)

The several classified aspects of airplane lighting applications are described in detail, and complete information is presented regarding lamps, lighting equipment, power supply, wiring systems, etc. Recommendations as to wire and lamp sizes are also given. G. H. W.

82. Light in Industry. R. Watkins Pitchford.

El. Times, 81, *p.* 183-185, *Feb. 11th*, 1932.

The effect of good lighting in the motor industry is studied. The standard of lighting in this industry is high, but not so high as that maintained in the American industry. There are three main schools—those who favour (1) local lighting only, (2) general lighting of high intensity, and (3) a combination of the two. In the author's opinion the third arrangement proved best in practice. Finally, special installations are described for special jobs, such as indirect lighting, for working bright metal filaments, and artificial-daylight lighting for the examination of accurate parts. The article gives illustrations of several types of lighting installed in factories. G. S. R.

83. Experiments on the Increase of Work in Coal-mining with Improved Illumination. C. Körfer.

Licht u. Lampe, 4, *p.* 51, 1932; *and* 5, *p.* 64, 1932.

Careful measurements of the speed at which two operations: (1) picking over coal, (2) shifting part of the plant, were carried out with different intensities of illumination. Test rooms were used which reproduced the conditions of a coal mine, and all stray light was excluded. E. S. B-S.

84. Better Street Lighting would avoid 130,000,000 Dollars Social Waste. Editorial.

El. World, 99, *p.* 394, *Feb. 27th*, 1932.

It is shown that the annual loss to the U.S.A. due to street accidents and burglary, and preventible by means of better street lighting, is about 130,000,000 dollars. W. C. M. W.

85. Effective Theatre Lighting. Anon.

El. Rev., 110, *pp.* 301-326, *Feb. 26th*, 1932.

Gives six photographs and a brief explanation of the lighting of the Little Theatre, Bournemouth, recently installed. G. S. R.

86. Good Lighting and the Prevention of Accidents. Ernst Wittig.

Zeits. des Vereines Deutscher Ingenieure, *Vol. 76, No. 12, pp.* 295-297, *March, 19th*, 1932.

The paper discusses the bearing of adequate general and local illumination on the prevention of accidents in industry with some reference to the effect of glare. The least values of illumination, both general and local, necessary for various types of work are tabulated, together with the corresponding recommended illuminations. The paper contains several photographs illustrating good and bad lighting conditions in industry. L. J. C.

87. Sydney Harbour Bridge. Anon.

Elect., 108, *p.* 391, *March 18th*, 1932.

A description is given with photograph of the lighting equipment of the new bridge. The lighting of the main traffic portion of the bridge is obtained from 157 lanterns of special design, each fitted with a 300-watt lamp and a prismatic dome refractor giving a non-axial distribution. The whole interior lighting unit can be removed for cleaning purposes. C. A. M.

88. Light and Architecture. Anon.

Am. Illum. Eng. Soc., Trans., 27, *pp.* 13-22, *Jan.* 1932; *and pp.* 115-122, *Feb.*, 1932.

Eighteen illustrated descriptions of modern lighting installations. G. H. W.

89. Syllabus of Stage Lighting. Prof. S. McCandless.

(*Published by Whitlock, Newhaven, U.S.A.*, 1931.)

Deals at length with the theoretical aspects of the subject, and gives some practical information in the form of tabulated lecture notes. Elementary physics and psychology in relation to light and colour are also treated. H. M. C.

90. Match the Psychology of Lighting with the Activity of the User. J. L. Kamm.

El. World, 99, *pp.* 242-3, *Jan. 30th*, 1932.

The author puts forward a scheme whereby the ratio of direct to indirect lighting in a system should be the same as the ratio of active work to mental work done. Examples are given in commercial problems and dual characteristic lighting is discussed. W. C. M. W.

VI.—MISCELLANEOUS.

91. Transmission of Light Through Fog. F. C. Breckenridge.

Am. Illum. Eng. Soc., Trans., 27, *pp.* 215-233, *Feb.*, 1932. (*Internat. Illum. Congress Paper* 154.)

The basis of the King formula and the Stratton and Houghton formula as applied to the spectral transmission of light through fog is briefly described. The procedure of a number of researches on this subject, together with the application of the theoretical formulæ to the results of these researches, are discussed. G. H. W.

National Illumination Committee of Great Britain

Report of the Committee for the year 1931, presented at the Annual Special Meeting on Tuesday, 16th February, 1932

THE work of the Committee during the year has naturally centred round the meetings of the International Illumination Congress and of the International Commission on Illumination in this country in September last. As mentioned in last year's annual report, the Committee had the benefit of the co-operation of the Illuminating Engineering Society in the organization of the Congress, and an Executive Committee consisting of members of the two bodies was set up and formed a number of sub-committees as set out below:—

Executive	...	Lt.-Col. K. Edgcumbe (*Chairman*)
Finance	...	Mr. L. B. Atkinson
Programme and Entertainments	...	Mr. C. W. Sully
Publicity	...	Sir F. Goodenough
Membership	...	Mr. J. Terrace
Papers	...	Dr. J. W. T. Walsh
Ladies	...	Mrs. C. C Paterson

By the beginning of the year these sub-committees were hard at work. A strong General Council was also formed, upon which, in addition to a number of influential members, the various organizations interested in illlumination were represented. Fortunately, the Executive Committee had the assistance of Colonel C. H. Silvester Evans, who kindly consented to act as Honorary General Secretary to the Congress, and in that capacity had placed the Committee very much in his debt by his generous and devoted service.

The Technical Sub-committee of the National Committee have been very active in bringing their various subjects up to the stage at which they could usefully be considered internationally at the meetings of the Commission. Most of the sub-committees formulated resolutions dealing with particular aspects of their subject in order that discussion at the subsequent meetings might be focussed on definite aspects instead of being discursive.

The meetings of both the Congress and the Commission proved very successful. More than 200 foreign visitors from over twenty countries attended. The Congress proceedings opened on September 1st with three days in London, a large number of buildings being brilliantly floodlighted for the occasion and for most of September. There were no technical meetings in London, but a number of technical visits were arranged. After London, the Congress made a tour of Glasgow, Edinburgh, Buxton (including Sheffield) and Birmingham. In each of these places one day was devoted to technical meetings, and visits were paid to places of technical or of general interest. The strong local committees which had been formed in each of these places did everything possible for the comfort and pleasure of their visitors and their efforts were much appreciated. In particular the Committee are greatly indebted to Mr. P. Good, who, as chairman of the London Committee, carried out most successfully a very difficult and heavy task. During the tour nearly one hundred papers were presented, many of which were of considerable importance. Thirty papers were presented on behalf of Great Britain.

The proceedings of the Congress were immediately followed by the meeting of the International Commission on Illumination at Cambridge, from September 13th to September 19th. The meetings were held in Trinity College, and a large number of the delegates were accommodated in the College.

The time at Cambridge was almost entirely spent in meetings of the 18 sub-committees which carry out the technical work of the Commission. Two general sessions were also held, at which papers dealing with other aspects of illumination were discussed. As a result of the experience so far gained in the allocation of the secretariat responsibility for the international study of various subjects to the different countries it was decided that the system should be continued for the next three years, but considerable changes were made in the allocation of the subjects. Great Britain accepted the secretariat responsibility for the study of Glare. Aviation Lighting, Traffic Signals, and the Lighting of Mines. A list of the various subjects which are being studied, together with the names of the countries which have accepted the secretariat responsibility, is given at the end of this report.

It is impossible to give adequately in a report of this nature details of the results of the meeting of the Commission. Exceedingly good accounts of the meetings of the Congress and of the Commission have appeared in the technical journals, in particular in *The Illuminating Engineer* for October and November.

The meetings of both the Congress and the Commission were held under the presidency of Mr. Clifford C. Paterson, and it is universally agreed that they stand out as a landmark in the development of the illuminating engineering movement in this country.

The Commission elected Dr. A. Meyer, of Germany, President for the next three years. Dr. J .W. T. Walsh retired from the office of Honorary Secretary, and Mr. Clifford C. Paterson was elected in his place. The Commission was invited to hold its next meeting in Germany in 1934.

The National Committee is greatly indebted to all those gentlemen and organizations, too numerous to mention individually, who have devoted so much time and energy to preparation for and the organization of the Congress tour and the meetings of the Congress and of the Commission. The success of the meetings is clearly indicative of the increasing recognition of the value of illumination and of the services which the illuminating engineer can render the nation by the provision of better lighting.

LIST OF SUBJECTS STUDIED BY THE INTERNATIONAL COMMISSION ON ILLUMINATION.

Subject	Secretariat Country. 1928–1931	1931–1934
(1) Vocabulary	Switzerland	Switzerland
(2) Definitions and Symbols	France	France
*(3) Light Standards	Central Bureau	——
*(4) Units of Candle-power and Intercomparisons of Lamps operating at different colours	Central Bureau	——
(5) Glare—Method of Determination in Street Lighting	France	Great Britain
*(6) Photometry of Discharge Tubes	——	Hungary
(7) Photometric Accuracy	Holland	Czechoslovakia
(8) Photometric Test Plates	Austria	Poland
*(9) Physical Photometry	——	France
(10) Colorimetry	Great Britain	Germany
(11) Diffusing Materials	Germany	Germany
(12) Light Flux Distribution	Belgium	Austria
(13) Street Lighting	Germany	Holland
(14) Automobile Headlights	United States	Belgium
(15) Factory and School Lighting	United States	United States
*(16) Architectural Lighting	——	France
(17) Aviation Lighting (Ground Lighting)	United States	Great Britain
(18) do. do. (Aircraft Lighting)	United States	United States
(19) Traffic Control Signals	Great Britain	Great Britain
(20) Coloured Glass for Signals	Great Britain	Japan
*(21) Artificial Daylight	——	Sweden
*(22) Shadows	——	Germany
*(23) Lighting of Mines	——	Great Britain
*(24) Ultra-violet Radiation	——	Holland
(25) Lighting Education	Great Britain	United States
(26) Lighting Practice	United States	Switzerland
*(27) Voltage Variations	——	Italy
(28) Cinema Lighting (Part of No. 26)	Japan	Switzerland

* New Subjects, 1931-1934.

On behalf of the Committee,

K. EDGCUMBE (*Chairman*).
H. BUCKLEY (*Hon. Secretary*).

Street Lighting in Leicester

The annual report of the Superintendent of Public Lighting in Leicester (Mr. Thomas Wilkie) is, as usual, divided into two sections dealing respectively with gas and electric lighting. The number of gas lamps in use for 1931 (5,793) was almost exactly the same as in the previous year. An item of considerable importance is the reduction, from the September quarter, in the price of gas, which has been diminished by nearly 3d. per 1,000 cubic feet. Part of the saving thus effected is being spent on improvements in gas lighting on certain bus routes. The average number of mantles used per nozzle per annum is now 3.032, as compared with 3.54 in 1930—a very material improvement. It is notable that the number of complaints attended to by the maintenance staff (apart from mantle renewal) is also considerably less than in 1930.

In the case of electric lighting the number of lamps in use has risen steadily from 830 to 1,336 during the past four years. During the same period the total candle-power furnished has increased from 888,783 to 1,067,008. The cost of public lighting (5.28d. per £) reverts almost exactly to the figure for 1929. (During 1930 there was a diminution to 4.75d.)

Commenting on certain recent installations of electric lighting, Mr. Wilkie draws attention to the influence of surrounding buildings in causing streets to appear "brightly lighted." Thus, in Charles Street and in the widened portion of Belgrave Gate the illumination in foot-candles is practically the same. The verdict of "poor lighting" in the former case was due to the lack of the usual reflection. A new feature in Charles Street has been the erection of 18 illuminated guide-posts.

The experiments with light-sensitive bridges mentioned in the last reports have been concluded. As these units, which appear to have functioned satisfactorily, operate with the rising and setting of the sun, it was thought expedient to compare the actual burning hours with the manual lighting schedule. Actually an increase of 490 over this schedule was shown; it should be remembered, however, that these units operate earlier on foggy or dull nights, which is regarded as an important point in their favour.

An Architects' Conference on Lighting

(Held at the E.L.M.A. Lighting Service Bureau (15, Savoy Street, Strand, London, W.C.), during March 2nd and 3rd, 1932.)

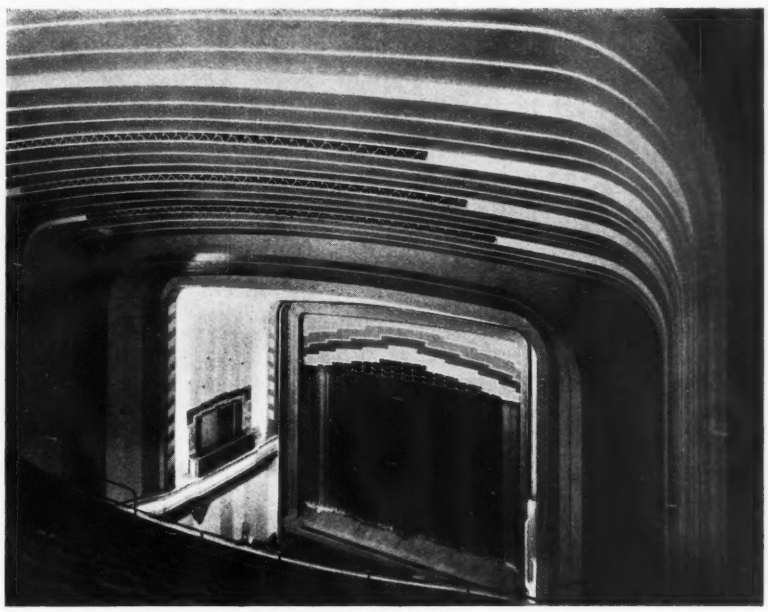
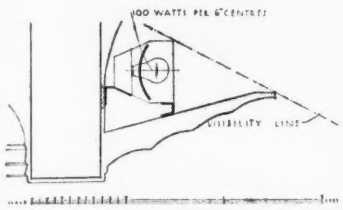


FIG. 1.—The Auditorium of the Saville Theatre (Shaftesbury Avenue, London). The main lighting is effected by a large trough on the back wall, and the longitudinal section of the ceiling is stepped down so that the light may pick up these facets and give emphasis to the ceiling contour. Additional lighting on the side walls immediately flanking the proscenium emphasizes the opening itself.



Plan of Installation.

AN enterprising departure during March 2nd and 3rd was the Conference on Lighting arranged at the E.L.M.A. Lighting Service Bureau (15, Savoy Street, London, W.C.). This was attended by about 150 architects, a number of whom took an active part in the various discussions.

The proceedings were opened at 10 a.m. on March 2nd by an introductory address by Mr. H. A. Lingard (Chairman of the E.L.M.A. Council), who summarized the work of the Lighting Service Bureau.

The morning programme also included addresses by Dr. J. W. T. Walsh on "Lighting Fundamentals," and by Mr. L. E. Buckell on "Characteristics of Electric Lamps." In the afternoon Mr. Waldo Maitland dealt with "Aims and Objects of Architectural Lighting." He drew attention to the results of lack of co-operation between engineers and architects and emphasized the importance of joint action at an early stage of construction. It not infrequently happened that the electrical contractor was called in to furnish fittings after the building was complete, with the result that little or no effect was secured beyond the provision of a certain illumination. Mr. Maitland also illustrated the tendency for points of light to give way to the use of large areas of translucent or opaque surfaces to transmit or reflect light. Such surfaces may be arranged to emphasize architectural features in a building, providing character and atmosphere.

As a result of such developments, embodied in architectural lighting schemes, the engineer is taking a new point of view, considering effect and quality of light quite as much as quantity. The technical details of such lighting schemes do, however, involve complexity, and the number of factors and variety of equipment to be studied by the architect is now considerable.

In the subsequent discussion a number of points were raised by Mr. Edward Warren, Mr. A. W. Harwood and others. The possibility of artificial lighting in churches from units mounted in the windows and the distinction between lighting for purposes of display and lighting to display architecture were among the topics discussed.

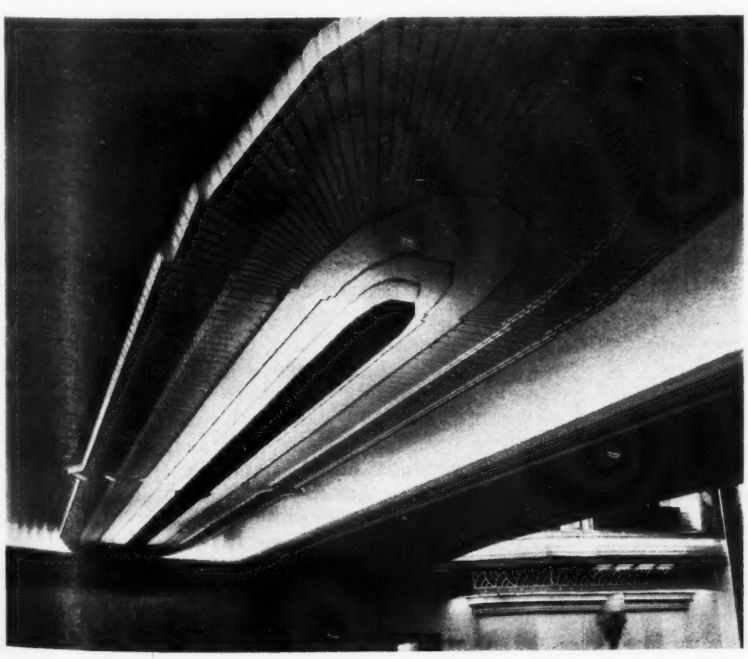
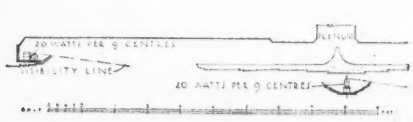


FIG. 2.—Soffit of Balcony of the Saville Theatre. Owing to the limited ceiling height available, the lighting of the stalls under the dress circle is a somewhat difficult problem. In this case the conditions are met by the use of a long trough suspended from the ceiling, which conceals the lamps and furnishes indirect lighting.



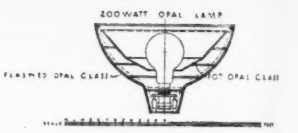
Plan of Installation.

A subsequent paper by Mr. Ronald Grierson was mainly of a technical nature, dealing with such practical points as access to ceiling and wall fittings, necessity of provision for special fittings, wiring systems, under-floor duct systems, false ceilings, hollow cornices, etc. The lecturer concluded by emphasizing the flexibility and varied applications of electricity.

The second day's session was opened by an introductory address by Sir John Brooke, C.B. (Vice-Chairman of the Electricity Commission), who welcomed the Conference, and who also commented on the need for co-operation between lighting architects and electrical engineers. He anticipated that the Commissioners would have practically completed the allocation of powers and duties to all authorised undertakers for the supply of electricity—except in very sparsely inhabited areas—within the next six months. Within five years there should be a supply of electricity available in almost every parish with a population exceeding 500.

Sir John Brooke also referred to the problem of tariffs, pointing out the benefit of the two-part method or so-called "telephone system," whereby a fixed annual charge is supplemented by a low running charge for current consumed.

FIG. 3.—The lighting of the third floor Office of Lloyds Bank, Cornhill, by means of fittings placed a little above the working plane and mounted on the floor. The lighting is substantially indirect, but monotony is avoided by allowing a small amount of light to penetrate the glass fitting.



Plan of Installation.

Mr. H. Lingard, who then dealt with Floodlighting, pointed out that co-operation between the architect and the lighting expert was specially desirable in this field. Although most familiar when applied to the façades of buildings, floodlighting has also industrial applications. When floodlighting was under consideration it was important to be sure that the building will respond to treatment—i.e., it should possess some architectural distinction, and its surface should preferably be light in colour. The most successful installations were those in which the architect has had floodlighting in mind from the commencement of the design, and had provided facilities for concealing equipment. Projectors should always be completely hidden from view. Floodlighting, however, was as yet in its infancy, and as a method of illumination had almost unlimited possibilities.

In the subsequent discussion Mr. R. Guthrie expressed his belief in floodlighting. He was a strong advocate of hidden light-sources. On the other hand, he did not like uniformity in interior lighting, and preferred some contrast. Mr. Williams and Mr. Maxwell Ayrton emphasized the importance of attention to shadows on floodlighted buildings.

Mr. W. J. Jones's paper dealt with a variety of lighting problems of special interest to architects, such as the lighting of churches, libraries and art galleries. His remarks were supplemented by numerous demonstrations and lantern slides. In connection with churches the avoidance of all bright lights liable to cause glare and the desirability of additional illumination of the altar or pulpit were emphasized. It was also suggested that artificial light might be applied from outside to stained-glass windows, so that their colouring might be displayed by night as well as by day. In picture galleries the special difficulties involved in the avoidance of direct reflections of bright objects in the glass of pictures were discussed in some detail. In common with previous speakers, Mr. Jones expressed a keen desire for co-operation between the architect and the illuminating engineer.

Yet other papers were delivered by Mr. W. Marsh, who discussed the lighting of commercial buildings, and Mr. Howard Robertson, who reviewed modern tendencies in the lighting of theatres, hotels, restaurants and exhibitions. Mr. Marsh quoted data to show that better lighting in factories improved output, and that display lighting attracted custom. The modern tendency was to make not only the lighted windows but the whole frontage of a shop an advertisement. Floodlighting, however, should only be adopted when the nature of the building justified it. Mr. P. J. Westwood, who proposed a vote of thanks to the E.L.M.A., and to Mr. Jones for arranging this conference with architects, endorsed what had been said regarding the importance of early consultation between architects and lighting experts, mentioning especially the desirability of allowing ample facilities in the form of ducts for wiring in view of possible extensions. He also mentioned the difficulty of finding adequate space for housing transformers in basements. In general, he preferred semi-indirect lighting in shops, special direct lighting being added to supplement certain features. Mr. Percy Marks said that merchants should exercise restraint, making their windows a display of choice objects rather than an inventory of all the goods available.

Mr. Howard Robertson, in his paper, analysed the objects with which light was applied in theatres, hotels, restaurants, etc. In general, decorative effect and publicity were both aimed at; if publicity could be obtained in an artistic manner so much the better. Artificial light should be treated as something different from daylight; in the evening, when one's mood and occupation were different, there was no object in trying to imitate conditions that prevailed during the day—though for practical purposes artificial daylight effects might be applied, as had been done in the basement of Lloyds Bank, in Cornhill. The same consideration applied to flood-

lighting of an exterior, which, however, should be studied by the architect with the same forethought as the design of the façade. Dealing with the need for co-operation between architect and illuminating engineer, he referred to church lighting as a field in which purely utilitarian and artistic aspects might be at variance. If a cathedral was so completely illuminated that every joint in the roof could be seen, one might kill interest in the interior. In the final section of his paper Mr. Robertson referred to a number of special problems, such as the design and equipment of showrooms, often inartistically carried out, the drawbacks of cornice lighting in rooms with low ceilings, and the expediency of utilizing semi-indirect lighting as a supplement to completely concealed lighting, so as to create a sense of brightness and contrast.

In the subsequent discussion Mr. R. A. Duncan expressed his interest in the idea that light was a "new building material," which might have a great effect upon building tradition. Psychology had a considerable influence on the impressions received from lighting schemes, and for this reason one would probably find it necessary to retain visible fittings. Mr. T. P. Bennett emphasized the high cost of purely indirect lighting, and the possibilities of coloured light in theatres and restaurants.

The Conference was concluded by a resolution approving the establishment of a joint committee, composed of architects and lighting experts, to discuss lighting practice, and the programme included the inspection of various lighting installations of interest, such as the Saville Theatre and Broadcasting House. The former installation is pictured in some of the illustrations accompanying this note, which appear in a supplement to the Handbook on Architectural Lighting opportunely issued by the E.L.M.A. Lighting Service Bureau.

Sheffield Illumination Society

A party composed of members and friends of the Sheffield Illumination Society paid a visit to the Sheffield Corporation Printing Department on 29th February last. This Department is one of the few printing works owned and controlled by municipalities, and carries out the entire printing and bookbinding requirements of the whole of the Corporation Departments, including the public libraries.

Members were conducted through the building, and had the opportunity of examining the machines and judging the efficiency of the system.

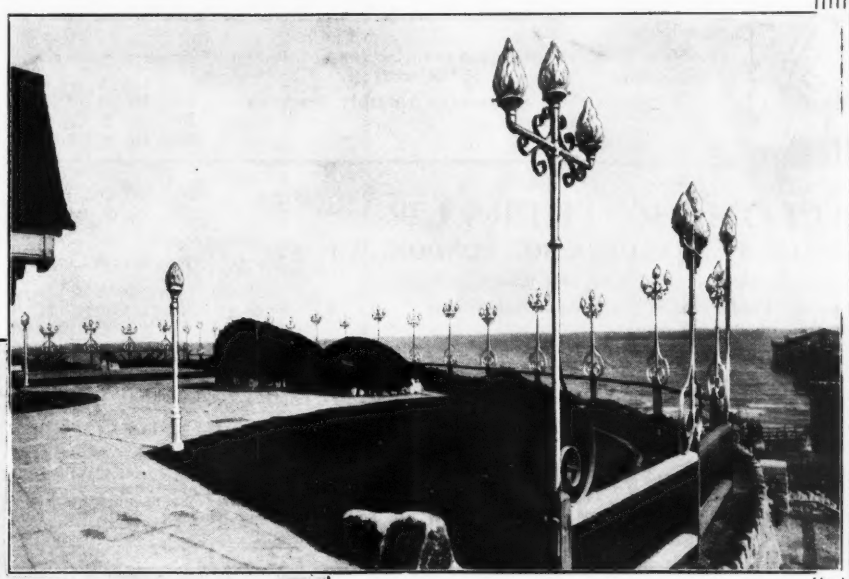
Foremen of the various sections each explained their own parts in the unit, and exposed their own personal knowledge of the work in hand. The department is fitted with the latest kinds of typesetting, printing, and lining machines in the printing section, and many small aids to efficiency in the bookbinding department, including taping and stitching machines, while the manual skill of the bookbinders is extremely high.

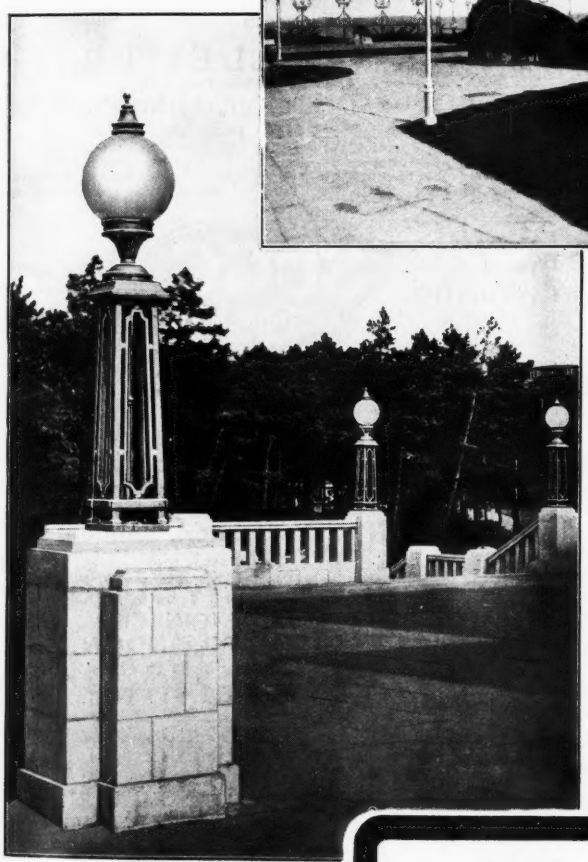
"Seeing: A Partnership between Lighting and Vision"

Readers will recall the review of the interesting volume under the above title which appeared in our February issue (p. 40). Our attention has been called to the fact that by some oversight the names of the authors of this original work were omitted. We gladly take this opportunity of correcting this oversight by stating that the joint authors of "Seeing: A Partnership between Lighting and Vision" are Dr. M. Luckiesh and Mr. F. K. Moss, who have been responsible for so many other contributions to the available literature on the relation between light and vision.

Permanent Illuminations at Bournemouth

The illustrations show the "REVO" Fittings and Standards installed in the Pavilion Gardens and Overstrand Cafe Gardens. Note how perfectly the Fittings suit these situations, and the special finish to resist climatic variations.





Sea fronts of popular resorts particularly lend themselves to permanent decorative lighting, which when carefully planned enhances the many attractions, and provides additional appeal to visitors.

At Bournemouth and Boscombe, the whole of the piers and pier-heads are illuminated by some 2,000 coloured lamps, mounted in specially designed "REVO" Fittings—a system impervious to bad weather.

The Pavilion and Overstrand Cafe Gardens are also illuminated by "REVO" Fittings and Standards in designs made specially to suit the situations.

The result undoubtedly REVOlutionizes the lighting of Bournemouth Sea Front.

"REVO" Engineers will gladly prepare schemes embodying special designs for similar installations, or utilising some of the hundreds of Fittings already designed and illustrated in Lists No. 14 and No. 169.

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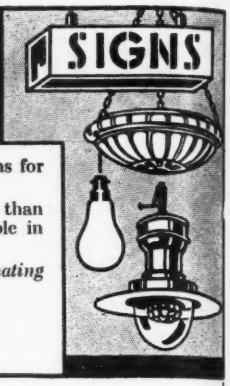

We invite applications for spaces in this new section of the journal. Particulars of terms for each space (approx. 1 inch deep and 3½ inches wide) are given below.

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Applicants desiring to take space in the "Directory of Lightning Equipment" are requested to bear in mind that copy should reach us preferably not later than the 20th of the month preceding the issue in which the series of insertions is to commence.

TRADE NOTES & ANNOUNCEMENTS

The Lighting of Sydney Harbour Bridge

We have received from the General Electric Co. Ltd. an illustrated booklet describing the great bridge spanning Sydney Harbour, foreseen more than 100 years ago, but only recently achieved. The total length of the bridge is 3,770 ft., the width 160 ft., and the height of the arch 437 ft. Its cost exceeds £5,000,000, and it is believed to be the largest bridge in the world. Electricity played a substantial part in the erection of the bridge. The bridge was first illuminated on the night of August 30th last year, and some 12,000 Osram lamps are used. It is stated that 157 non-axial refractor units, each containing a 300-watt Osram lamp, have been adopted for installation in the permanent lanterns supplying the main span and roadway approach lighting.

We are also informed that 140 Holophane street-lighting refractors of the type recently used in such large numbers in Santiago, Buenos Ayres, and other cities, have been specified and installed for the lighting of this bridge. Further particulars of these and other units may be obtained from the latest Street-lighting Brochure just published by Holophane Ltd.

The British Industries Fair, Birmingham

From observation one is inclined to draw the conclusion that the British Industries Fair, Birmingham, attracted bigger crowds than ever this year. As usual, lighting was well represented, though, if we except the interesting new form of Newbridge switch shown by the Horstman Gear Co. Ltd., there were not many outstanding novelties. Novel and modern gas-lighting fittings were, however, on view at the stalls of Wm. Sugg & Co. Ltd., Foster & Pullen Ltd., and others, and the Lighting Trades Ltd. and the Welsbach Light Co. Ltd. had, as usual, a representative array of mantles and burners. Many other firms show gas-lighting and heating equipment of standard design.

The electrical section of the exhibition was very extensive, and only a relatively small part was devoted to lighting. There were, however, displays by many firms whose names are familiar, such as the British Thomson-Houston Co. Ltd., Credenda Conduits Ltd., the General Electric Co. Ltd., Revo Electric Co. Ltd., and Simplex Conduits Ltd. The exhibit of the General Electric Co. Ltd., showing the actual making of Osram lamps, naturally attracted sightseers, and the other stalls mentioned contained effective displays of street-lighting lanterns, luminous traffic-control equipment, etc.

Floodlighting by Gas

The most recently issued number of "A Thousand and One Uses for Gas" should be an eye-opener to those who do not realize its possibilities for floodlighting. The display of landscape lighting in St. James's Park naturally receives the place of chief importance, but many other applications are shown. The International Illumination Congress served to bring home these possibilities, and there is no doubt that "floodlighting has come to stay."

Brighter Milk!

The Electrical Department of the Express Dairy Company evidently believe in sales stimulation during the darker hours. For the illuumination of the windows at their Rosemary Avenue branch, Hounslow, they employed Ediswan Floodrays with 200-watt Royal Ediswan Lamps. The above illustration, furnished by the Edison Swan Electric Co. Ltd., gives a good idea of the effect of this brightly illuminated show window.

Mr. J. N. Stephens

Readers will hear with interest of the appointment of Mr. J. N. Stephens to the Board of the Edison Swan Electric Co. Ltd. Mr. Stephens has had a long association with the electrical industry. Originally a student under Professor Silvanus Thompson at Finsbury, he was for a number of years associated with the National Electric Construction Co. Ltd. In 1903 he joined the British Thomson-Houston Co. Ltd., in London, and in 1910 helped to create the Mazda lamp organization. He was responsible for the planning of Mazda House, Upper Thames Street, opened in 1912, and subsequently acted as manager of the department dealing with modern lighting appliances and wiring supplies.

Siemens Electric Lamps and Supplies Ltd.

EXTENSION OF PREMISES.

It is gratifying to learn, as an indication of revival of trade, that Messrs. Siemens Electric Lamps and Supplies Ltd. have found it necessary to obtain further storage accommodation at the rear of their premises at 38-39, Upper Thames Street, London. This extension, which comprises three large floors, will render it possible to carry larger stocks of Siemens lamps, cables, batteries, appliances, fittings accessories, etc., and to provide an even more efficient service to the trade.

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